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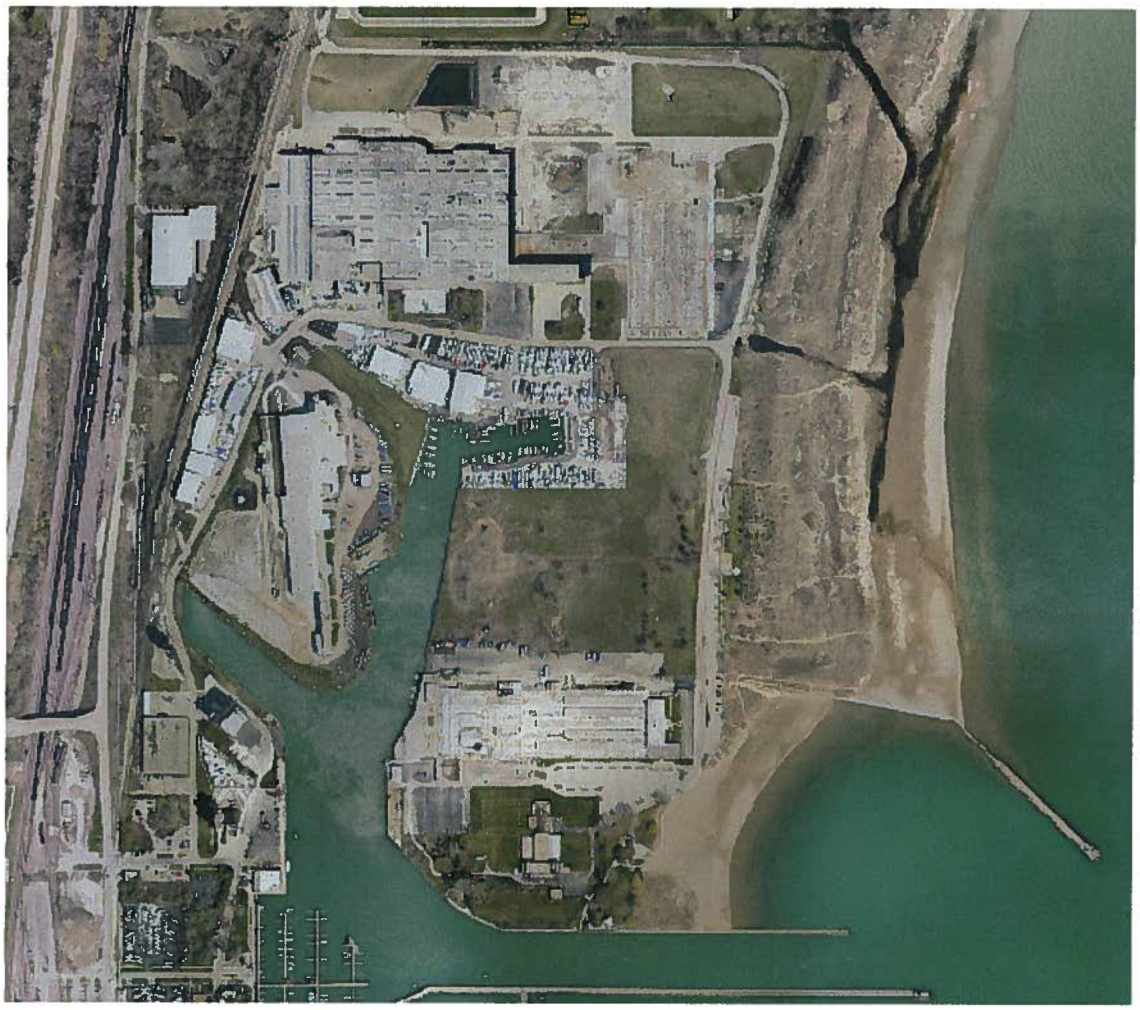
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

RECORD OF DECISION

Outboard Marine Corporation Superfund Site
Waukegan, Lake County, Illinois



Selected Remedial Alternatives for the OMC Plant 2 Site (Operable Unit #4)

February 2009

Cover photo credit: City of Waukegan, Eng. Dept.

This 2007 aerial photo shows the entire Outboard Marine Corporation (OMC) Superfund site in Waukegan, Illinois. North is at the top of the frame. The OMC site includes the (northern) Waukegan Harbor site, the OMC Plant 2 (or "North Plant") site (the large building at the top of the photo), and the Waukegan Manufactured Gas and Coke Plant site (cleared area in center of frame). Lake Michigan can be seen to the east of the sand dune and beach areas.

Below is a map of Waukegan for comparison:

Waukegan, Illinois

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Selected Remedial Alternatives for the
Outboard Marine Corporation Plant 2 Site

Site Name and Location

Outboard Marine Corporation (OMC) Plant 2 site, Waukegan, Lake County, Illinois

CERCLIS identification number: ILD000802827

The OMC Plant 2 site is the fourth of four operable units of the OMC Superfund site.

Statement of Basis and Purpose

This decision document presents the selected remedial actions for the Outboard Marine Corporation (OMC) Plant 2 site, Operable Unit #4 (OU4) of the OMC Superfund site, Waukegan, Illinois. The United States Environmental Protection Agency (U.S. EPA), in consultation with the Illinois Environmental Protection Agency (Illinois EPA), chose the remedies in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Our decisions are based on the Administrative Record for the OMC Plant 2 site.

Assessment of the Site

The response actions selected in this Record of Decision (ROD) are necessary to protect the public health or welfare or the environment from the actual or threatened release of hazardous substances, pollutants, or contaminants into the environment.

Description of the Selected Remedy

The U.S. EPA has identified four media of concern at the OMC Plant 2 site. These are the OMC Plant 2 building, soil and sediment, groundwater, and a dense, non-aqueous phase liquid (DNAPL) deposit. The selected cleanup actions herein address the OMC Plant 2 groundwater and DNAPL media. We previously issued a ROD for the OMC Plant 2 building and the soil and sediment media in September 2007. We project that the groundwater and DNAPL cleanup remedies selected in this ROD will be the final remedial actions selected for the OMC Plant 2 site.

The selected remedial actions for the DNAPL and groundwater media include:

- the utilization of soil mixing technology to inject zero-valent-iron (ZVI) and bentonite clay into the trichloroethene (TCE) DNAPL to destroy and isolate the TCE DNAPL *in situ*;
- the injection of a soluble substrate (sodium lactate or equivalent) into the groundwater source areas to enhance the *in situ* anaerobic bioremediation of dissolved chlorinated volatile organic compounds (VOCs) including TCE, vinyl chloride (VC), and 1,2-dichloroethene (DCE);
- the installation of an air sparge curtain to prevent off-site movement of dissolved chlorinated VOCs in groundwater; and
- the application of monitored natural attenuation (MNA) and institutional controls post-construction to monitor conditions and protect human health and the environment until final cleanup levels are reached.

Implementation of the selected remedial actions herein, in concert with the remedies selected in the September 2007 ROD, will allow for nearly unlimited re-use of the OMC Plant 2 site. There are two PCB containment cells (OU3) located on the site and these are the only areas of the site that will not allow for unrestricted use and unrestricted exposure (UU/UE) to residual contaminants.

The NCP establishes an expectation that U.S. EPA will use treatment technology to address principal threat wastes at a site wherever practicable. We consider the groundwater media at the OMC Plant 2 site to present a low level, long-term threat to human health or the environment and to not be a principal threat. The NCP principal threat treatment expectation thus does not apply to the groundwater contaminant plume. We do consider the TCE DNAPL, however, to be a principal threat for which the statutory preference for treatment as a principal element applies. Implementation of *in situ* soil mixing using ZVI to destroy the bulk of the TCE DNAPL does satisfy the statutory expectation for permanent treatment of principal threat wastes.

Statutory Determinations

The selected remedial actions are protective of human health and the environment, comply with federal and State of Illinois requirements that are applicable or relevant and appropriate to the remedial actions, are cost-effective, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The selected remedies herein satisfy the statutory preference for treatment as a principal element of the remedy because the *in situ* soil mixing action will address the principal threat waste (TCE DNAPL) at the site.

The U.S. EPA will perform a statutory five-year review of the selected remedial actions for the OMC Plant 2 operable unit to determine whether the remedies are or will be protective of human health and the environment because they will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels allowing for unlimited use and unrestricted exposure for some time. Additionally, we will continue to perform statutory five-year reviews of the selected remedial actions for the OMC site as a whole because cleanups at individual operable units may have left or will leave hazardous substances, pollutants, or contaminants remaining on site in excess of levels allowing for UU/UE.

ROD Data Certification Checklist

The U.S. EPA has included the following information in the Decision Summary section of the OMC Plant 2 site groundwater and DNAPL media ROD. More detailed site information is included in the Administrative Record for the OMC Plant 2 site (see Page viii).

- The contaminants of concern and their concentration levels (see Page 21)
- Baseline risks represented by the contaminants of concern (see Pages 24-27)
- Cleanup levels established for the contaminants of concern and the basis for these levels (see Page 28)
- How source materials constituting principal threats are addressed (see Page 43)
- Potential land use that will be available at the site as a result of the selected remedy (see Pages 46-48)
- Estimated capital and operation and maintenance costs for the remedy, including present worth and discount rates (see Page 47)
- Key factor(s) that led to selection of the remedial actions for the OMC Plant 2 operable unit (see Page 48 – Statutory Determinations)

State Concurrence

The State of Illinois has indicated its intention to concur with the selected remedy. The Letter of Concurrence will be attached to this Record of Decision upon receipt.

Approved by: Richard C Karl 2-27-09

Richard C. Karl, Director
Superfund Division
U.S. Environmental Protection Agency
Region 5

Date

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 North Grand Avenue East, P.O. Box 19276, Springfield, Illinois 62794-9276 • (217) 782-2829
James R. Thompson Center, 100 West Randolph, Suite 11-300, Chicago, IL 60601 • (312) 814-6026

PAT QUINN, GOVERNOR **DOUGLAS P. SCOTT**, DIRECTOR

217-524-1655

May 22, 2009

Mr. Richard C. Karl
United States Environmental Protection Agency
77 West Jackson Boulevard
Mail Code S-6J
Chicago, Illinois 60604-3507

Re: 0971900017 – Lake County
Outboard Marine Corporation Plant 2 NPL Site – Operable Unit 4
ILD 000 802 827
Superfund/Technical Reports

Dear Mr. Karl:

The purpose of this letter is to transmit the formal concurrence of the State of Illinois on the Record of Decision (ROD) for the Outboard Marine Corporation National Priorities List Site Plant 2 Operable Unit 4 in Waukegan, Illinois.

If you should have any questions, need any additional information, or require any assistance regarding this matter, please contact me at 217-524-1655 or via electronic mail at: clarence.smith@illinois.gov.

Respectfully,

Clarence L. Smith, Manager
Federal Site Remediation Section
Division of Remediation Management
Bureau of Land

Attachment

DECLARATION FOR THE RECORD OF DECISION

Outboard Marine Corporation National Priorities List Site
Selected Remedial Alternatives for the
OMC Plant 2 Site – Operable Unit 4
Dense Non-Aqueous Phase Liquid and Groundwater Portion
Waukegan, Lake County, Illinois

SITE NAME AND LOCATION

Outboard Marine Corporation National Priorities List Site
Outboard Marine Corporation Plant 2 – Operable Unit 4
0971900017 – Lake County
CERCLIS Identification Number ILD 000802827
Waukegan, Illinois

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial actions for the Outboard Marine Corporation (OMC) Plant 2 National Priorities List (NPL) site, Operable Unit 4 located in Waukegan, Lake County, Illinois (CERCLIS identification number ILD000802827). The United States Environmental Protection Agency (USEPA), in consultation with the Illinois Environmental Protection Agency (Illinois EPA), chose the remedies in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA or Superfund) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 Code of Federal Regulations (CFR) 300-399). This decision is based on the Administrative Record for the OMC Plant 2 NPL site.

This declaration indicates the State of Illinois concurrence with selection of Alternative D5 and Alternatives G3b and G7 be implemented to clean up the DNAPL and the groundwater contaminants respectively at the OMC site. When USEPA receives the state's letter of concurrence, it will be attached to the Record of Decision (ROD).

BACKGROUND

The OMC Plant 2 building is a one million square-foot facility in which OMC made outboard motors from about 1948 until it declared bankruptcy on December 22, 2000. The facility used polychlorinated biphenyl (PCB) containing hydraulic and lubricating oils in its production lines beginning in 1961 until 1972 and these oils are the source of the PCBs in Waukegan Harbor sediment. OMC also operated many vapor degreasers at the facility to clean newly made parts with 1,1,2-trichloroethylene (TCE). The degreasers and/or TCE storage tanks are the main sources of the TCE groundwater contaminant plume and the area of dense non-aqueous phase liquid (DNAPL) beneath the site.

Studies found that certain areas of the OMC Plant 2 NPL site contain chemical contaminants above human health based concentrations in subsurface soil and groundwater. Subsurface soil and groundwater are contaminated with chlorinated volatile organic compounds (VOCs) such as TCE and the breakdown daughter product, 1-chloroethylene (i.e., vinyl chloride). Should the groundwater be used for drinking purposes, it would pose an unacceptable risk to human health. If the site is redeveloped, TCE vapor intrusion into residential units from the contaminant plume could also pose unacceptable risks to human health. The TCE DNAPL would act as a long term source of dissolved TCE in the groundwater beneath the site.

Figure 1 depicts the locations of the impacted groundwater and the DNAPL areas on the OMC Plant 2 site.

ASSESSMENT OF THE SITE

The response actions selected in this ROD are necessary to protect the public health or welfare or the environment from the actual or threatened release of hazardous substances, pollutants, or contaminants into the environment.

DESCRIPTION OF THE SELECTED REMEDY

USEPA identified four media of concern at the OMC Plant 2 site. These are the OMC Plant 2 building, soil and sediment, groundwater, and dense, non-aqueous phase liquid (DNAPL) deposits.

USEPA's first proposed clean-up plan for the OMC Plant 2 site addressed the contaminants (mostly polychlorinated biphenyls (PCBs) found within large portions of the OMC Plant 2 building and in soil and sediment outside the facility. A ROD was issued in September 2007 that called for USEPA to demolish and dispose of the contaminated building and to excavate and dispose of contaminated soil and sediment. The work for that portion was let out for bid in August 2008.

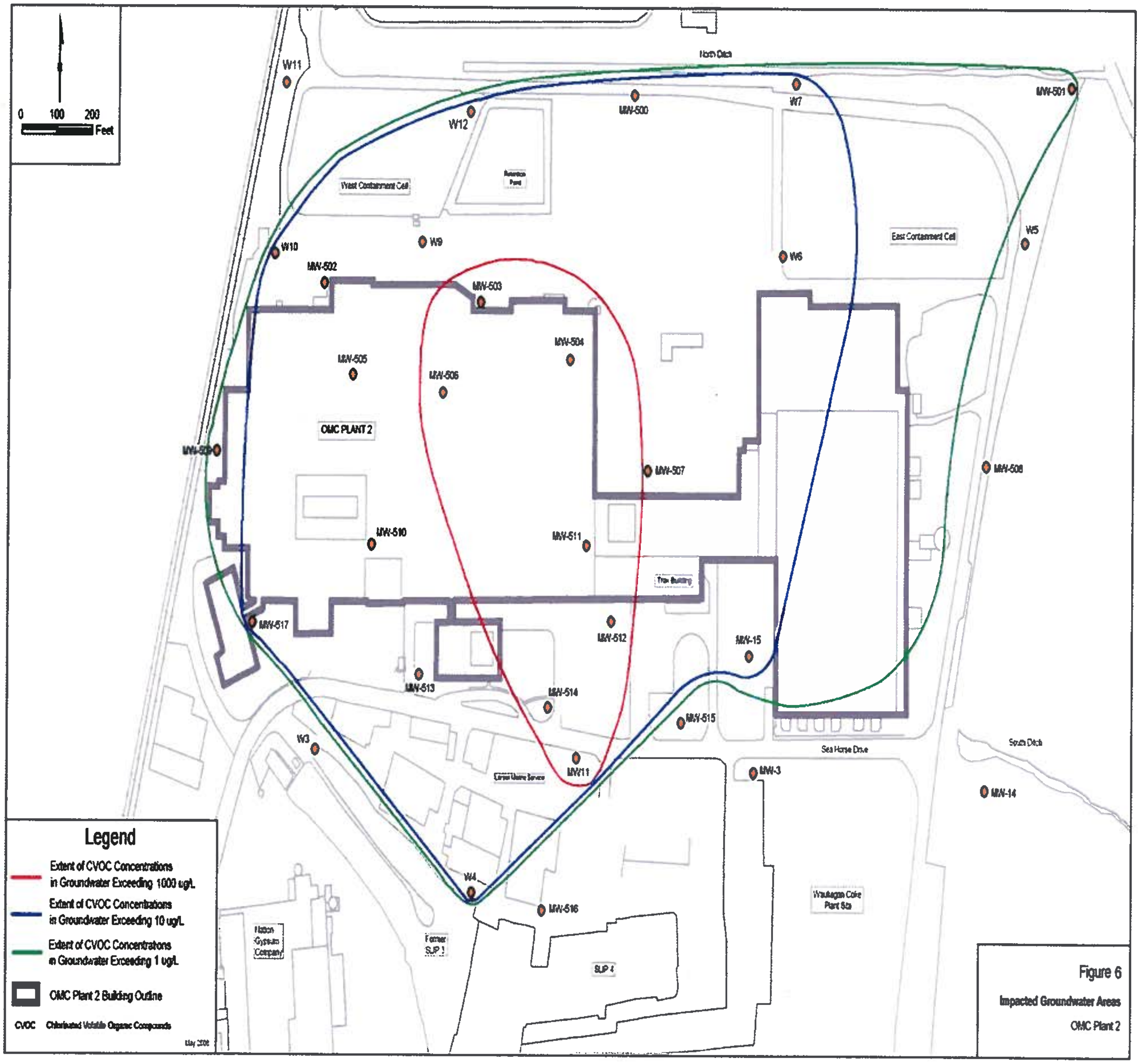
This second proposed plan addresses the TCE and daughter compounds found in a groundwater contaminant plume and the pools of TCE DNAPL found in the subsurface soil beneath the plant building. Treatability studies on these contaminants were completed in the spring 2008 and a feasibility study report addendum was issued that detailed the analysis of the results of the treatability studies in July 2008.

The proposed plan includes:

- Chemical reductive treatment of the TCE DNAPL *in situ* of a designated area of the site.
- Enhanced bioremediation of TCE in groundwater *in situ* using a soluble substrate.
- The construction and operation of an air sparge curtain on a portion of the site to help prevent movement of the groundwater contaminant plume offsite while the enhanced bioremediation remedy is underway.

It is estimated that this plan to clean up the OMC Plant 2 site groundwater and DNAPL has a total present worth cost of about $12.7 million dollars and it would take approximately 12

Figure 1



0 100 200
Feet
North Ditch
W11
W12
MW-500
W7
MW-501
West Containment Cell
East Containment Cell
W10
W9
W6
W5
MW-502
MW-503
MW-504
MW-505
MW-506
OMC PLANT 2
MW-507
MW-508
MW-509
MW-510
MW-511
Trax Building
MW-517
MW-512
MW-15
MW-513
MW-514
MW-515
W3
MW11
Sea Horse Drive
South Ditch
MW-3
MW-14
W4
MW-516
Waukegan Coke Plant Site
Former SLIP 3
SLIP 4
Legend
Extent of CVOC Concentrations in Groundwater Exceeding 1000 ug/L
Extent of CVOC Concentrations in Groundwater Exceeding 10 ug/L
Extent of CVOC Concentrations in Groundwater Exceeding 1 ug/L
OMC Plant 2 Building Outline
CVOC Chlorinated Volatile Organic Compounds
Figure 6
Impacted Groundwater Areas
OMC Plant 2

months to complete the construction of the remedies. However, due to the nature of groundwater contamination, it will take many years to achieve the clean-up goals.

Alternative D5, *In-Situ* Chemical Reduction

The goal of this cleanup alternative is to achieve approximately eighty percent destruction of TCE. It uses conventional soil mixing equipment to allow for the incorporation of soil amendments such as zero-valent iron (ZVI) into the TCE DNAPL. The iron corrodes in the groundwater and releases hydrogen gas. The hydrogen in turn reduces the TCE by causing dechlorination.

Completion of the TCE reduction step could occur in as few as six months after the ZVI was injected into the soil. USEPA would then periodically monitor the area. The estimated present worth cost to implement Alternative D5 is $1,980,000; including estimated periodic monitoring costs and expenses related to performance of five-year reviews at the site.

Alternative G3b, Enhanced *In-Situ* Bioremediation with Soluble Substrate (with MNA)

Alternative G3b is an active treatment method intending to lower the contaminant levels in the plume in place. Originally, three different methods were evaluated – chemical reduction, soluble substrate addition for bioremediation, and edible oil substrate for bioremediation. Each method is intended to create a zone of strongly reducing conditions in the aquifer which would accelerate the reductive dechlorination of the TCE. Alternative G3b would use the addition of a carbon source to increase the anaerobic bacteria levels that would lead to biochemical reduction or "consumption" of the TCE by the bacteria.

The treatment method could reduce the estimated mass of TCE in the groundwater by approximately ninety six percent. Afterwards, a Monitored Natural Attenuation (MNA) approach would be used to track the reduction of the plume for several decades until cleanup levels are met.

Injection activity for Alternative G3b could be completed over the course of several years. The estimated present worth cost to implement this alternative is $8,300,000; including estimated periodic monitoring costs and expenses related to performance of the five-year reviews at the site.

Alternative G7, Air Sparge Curtain

Alternative G7 is the installation of an Air Sparge Curtain (ASC) system along the southern boundary of the site to treat TCE in the groundwater as it moves off site towards the harbor. The ASC would consist of a 1000-foot slotted pipe horizontally drilled into the aquifer. Air would be pumped through the slots to aid in the volatilization of TCE out of the groundwater before it flowed off site. If necessary, the volatilized TCE could be recovered using Soil Vapor Extraction (SVE) equipment. The ASC system will operate for approximately 30 years. The estimated present worth cost to implement this alternative is $2,430,000; including estimated periodic monitoring costs and expenses related to performance of the five-year reviews at the site.

STATUTORY DETERMINATIONS

Superfund law requires remedial actions to achieve the protection of human health and the environment in compliance with federal and state environmental laws and policies (i.e., applicable or relevant and appropriate regulations (ARARs)). Selected clean up remedies must also be cost-effective and use permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, with an emphasis on clean up remedies that employ treatment to permanently and significantly reduce the toxicity, mobility, or volume of the hazardous substances, pollutants, or contaminants. Based upon the evaluation of the nine criteria, it is believed the proposed clean-up plan would be protective of human health and the environment, would attain ARARs, would be cost-effective, and would use treatment technologies to permanently and significantly reduce the toxicity, mobility, or volume of the hazardous substances, pollutants, or contaminants to the maximum extent practicable because the *in situ* soil mixing action will address the principal threat waste (TCE DNAPL) at the site.

USEPA will perform a statutory five-year review of the selected remedial actions for the OMC Plant 2 Operable Unit 4 to determine whether the remedies are or will be protective of human health and the environment because they will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels allowing for unlimited use and unrestricted exposure (UU/UE) for some time. USEPA will continue to perform statutory five-year reviews of the selected remedial actions as well as for the OMC site as a whole, as cleanups at other individual operable units may have or will leave hazardous substances, pollutants, or contaminants remaining on site in excess of levels allowing for UU/UE.

ROD DATA CERTIFICATION CHECKLIST

U.S. EPA has included the following information in the Decision Summary section of the OMC Plant 2 site ROD. More detailed site information is included in the Administrative Record for the OMC Plant 2 site (see Page viii).

- The contaminants of concern and their concentration levels (see Page 20);
- Baseline risks represented by the contaminants of concern (see Page 26);
- Cleanup levels established for the contaminants of concern and the basis for these levels (see Page 28;
- How source materials constituting principal threats are addressed (see Page 39);
- Potential land use that will be available at the site as a result of the selected remedy (see Page 46);
- Estimated capital and operation and maintenance costs for the remedy, including present worth and discount rates (see Page 45);
- Key factor(s) that led to selection of the remedial actions for the OMC Plant 2 operable unit (see Page 46– Statutory Determinations).

AUTHORIZING SIGNATURE

Douglas P. Scott

Douglas P. Scott, Director
Illinois Environmental Protection Agency

May 18, 2008

Date

Administrative Record List of Documents
OMC Plant 2 Site

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	03/01/07	CH2M HILL	U.S. EPA	Technical Memorandum Re: Dense Non-Aqueous Phase Liquid Investigation for Outboard Marine Corporation (OMC) Plant 2 (OU-4) **(SDMS ID: 299805)**	51
2	03/01/08	CH2M HILL	U.S. EPA	Enhanced In Situ Bio-remediation Pilot Study, for the OMC Plant 2 Site RI/FS **(SDMS ID: 299806)**	129
3	03/00/08	CH2M HILL	U.S. EPA	Data Evaluation Summary Report for the OMC Plant 2 Site RI/FS **(SDMS ID: 299807)**	349
4	07/01/08	CH2M HILL	U.S. EPA	Supplemental FS Report for the OMC Plant 2 Site RI/FS **(SDMS ID: 299808)**	153
5	08/00/08	U.S. EPA	Public	Final Fact Sheet: EPA Proposes Cleanup Plan for OMC Plant 2 Site (English) **(SDMS ID: 299809)**	10
6	08/00/08	U.S. EPA	Public	Final Fact Sheet: EPA Proposes Cleanup Plan for OMC Plant 2 Site (Spanish) **(SDMS ID: 299810)**	11
7	Aug-Oct 2008	Public	U.S. EPA	Comments on Proposed Plan; e-mail or letters	
8	09/04/08	U.S. EPA/Public	U.S. EPA	Transcript - Proposed Plan public meeting; verbal comments	
9	05/22/09	State	U.S. EPA	Concurrence letter OMC Plant 2 Groundwater and DNAPL Record of Decision	

Glossary

OMC Plant 2 Site
Waukegan, Lake County, Illinois

Note: The following terms or expressions may be used throughout this document:

Carcinogenic risk: The incremental probability that an individual will develop cancer over a lifetime as a result of exposure to a carcinogen. A risk number is usually expressed in scientific notation (e.g., $1x10^{-6}$) and is referred to as an "excess lifetime cancer risk" (or "ELCR") because it would be in addition to the risk that individuals face of developing cancer from other potential causes such as smoking or exposure to too much sunlight. An excess lifetime cancer risk of $1x10^{-6}$ indicates that an individual experiencing the reasonable maximum exposure to a carcinogen at a site has an extra one in one million chance of developing cancer over his/her lifetime. (The probability of an individual in the U.S. developing cancer from all other causes has been estimated to be as high as one in three.) U.S. EPA generally cleans up Superfund sites to achieve a target carcinogenic risk range of $1x10^{-4}$ to $1x10^{-6}$ excess lifetime cancer risk.

Gram (g): Metric unit of mass and weight measurement (about 28.3 grams equal one ounce).

Hazard Index (HI) Quotient: The ratio between the amount of a non-carcinogenic chemical contaminant that an individual may be exposed to at a site to the amount of the contaminant that causes an adverse toxic reaction within the body. An HI quotient of 1 or more means that there is enough contaminant at the site to cause a toxic reaction in a person should one be exposed to the contaminant. U.S. EPA generally cleans up Superfund sites to achieve a HI quotient of less than 1 for non-carcinogenic compounds.

Kilogram (kg): Metric unit of mass and weight measurement equal to 1000 grams (about 2.2 pounds or about 1 liter of pure water).

Liter (L): Metric unit of volume measurement (about 3.78 liters equal one gallon).

Micro (μ): Prefix denoting one millionth part of something. Example: 1 microgram (μg) is one millionth of a gram.

Milli (m): Prefix denoting one thousandth part of something. Example: 1 milligram (mg) is one thousandth of a gram.

Operable Unit (OU): U.S. EPA sometimes divides up a complex cleanup site into discrete portions, termed operable units, to better manage the overall cleanup action. At the OMC site, OU #1 is the Waukegan Harbor site, OU #2 is the Waukegan Coke Plant site, OU #3 is the PCB Containment Cells, and OU #4 is the OMC Plant 2 site.

Acronyms and Abbreviations

µg/100 cm^2	Micrograms per 100 square centimeters
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
ARAR	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CFR	Code of Federal Regulations
COC	Contaminant of concern
DCE	Dichloroethene (site-specific: *cis*-1,2-dichloroethene)
DNAPL	Dense nonaqueous phase liquid
ELCR	Excess lifetime cancer risk
FR	*Federal Register*
FS	Feasibility Study
HI	Hazard Index
IAC	Illinois Administrative Code
IL EPA	Illinois Environmental Protection Agency
L	Liter
mg/kg	Milligrams per kilogram (parts per million)
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OMC	Outboard Marine Corporation
OU	Operable unit
PAHs	Polyaromatic hydrocarbons
PCBs	Polychlorinated biphenyls
ppb	Parts per billion (µg/kg or µg/L)
ppm	Parts per million (mg/kg or mg/L)
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
ROD	Record of Decision
sq. ft.	Square feet
SVOC	Semi-volatile organic compound
TACO	Tiered Approach to Cleanup Objectives (Illinois Administrative Code)
TCE	Trichloroethene
TSCA	Toxic Substance Control Act
U.S. EPA	United States Environmental Protection Agency
VC	Vinyl chloride
VOC	Volatile organic compound
yds^3	Cubic yards

DECISION SUMMARY

OMC Plant 2 Site
Waukegan, Lake County, Illinois

A. Site Location and Description

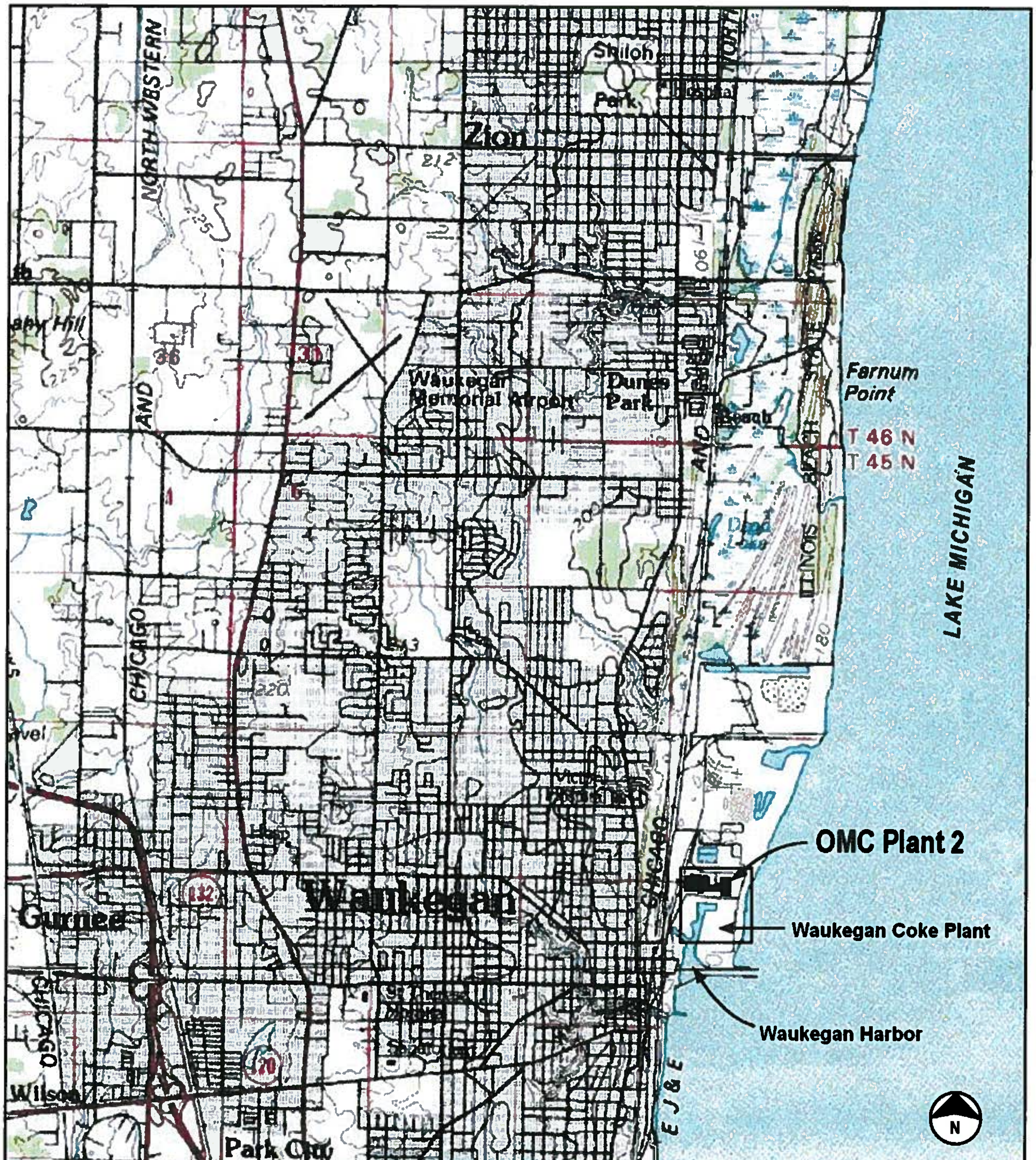
The OMC Plant 2 site is the fourth of four operable units (OU) of the Outboard Marine Corporation (OMC) National Priorities List (NPL) site. It is located at 90 Sea Horse Drive in Waukegan, Illinois, about 40 miles north of Chicago (Figure 1). Figure 2 displays all of the four OMC site operable units that also include the Waukegan Harbor site (OU #1), the Waukegan Manufactured Gas and Coke Plant ("Waukegan Coke Plant") site (OU #2), and the PCB Containment Cells (OU #3).

The CERCLIS identification number for the OMC site is ILD000802827.

The United States Environmental Protection Agency (U.S. EPA) ("we" or "us") is the lead agency and the Illinois Environmental Protection Agency (Illinois EPA) is the support agency at the OMC site. To date, we have used potentially responsible party (PRP) and Superfund trust fund monies to perform several time-critical removal actions, a pilot test study for groundwater cleanup, a bench scale study for dense, non-aqueous phase liquid (DNAPL) cleanup, and a remedial investigation and feasibility study at the OMC Plant 2 site. We are also preparing to spend Superfund trust fund monies to conduct the remedial design for the remedial actions selected herein in spring 2009 and to initiate a remedial action at the site in fall 2009.

The OMC Plant 2 site is a 60-acre lakefront parcel that contains an abandoned industrial facility in which OMC manufactured outboard motors. At one point the facility had used polychlorinated biphenyl (PCB)-containing hydraulic and lubricating oils in its production lines and routinely discharged some of the fluids into outside holding lagoons or ponds. Poor housekeeping led to extensive PCB contamination inside the facility. Fluids were also discharged via sewer lines into Waukegan Harbor (OU#1), thereby becoming the source of very high-level PCB contamination in harbor sediment. OMC also operated several vapor degreasers at the OMC Plant 2 facility to clean newly made parts with trichloroethylene (TCE). Leaking degreasers and/or TCE storage tanks over the years created a widespread groundwater contaminant plume of dissolved TCE and a sizeable pool of pure, undissolved TCE (termed a "dense, non-aqueous phase liquid" or "DNAPL") beneath the site.

OMC declared bankruptcy in December 2000 and ceased all local operations in August 2001. Much of the OMC site is now owned by the City of Waukegan.



Source: USGS Waukegan Quadrangle Map

0 3,000 Feet

Figure 1

Site Location Map

OMC Plant 2 and Vicinity

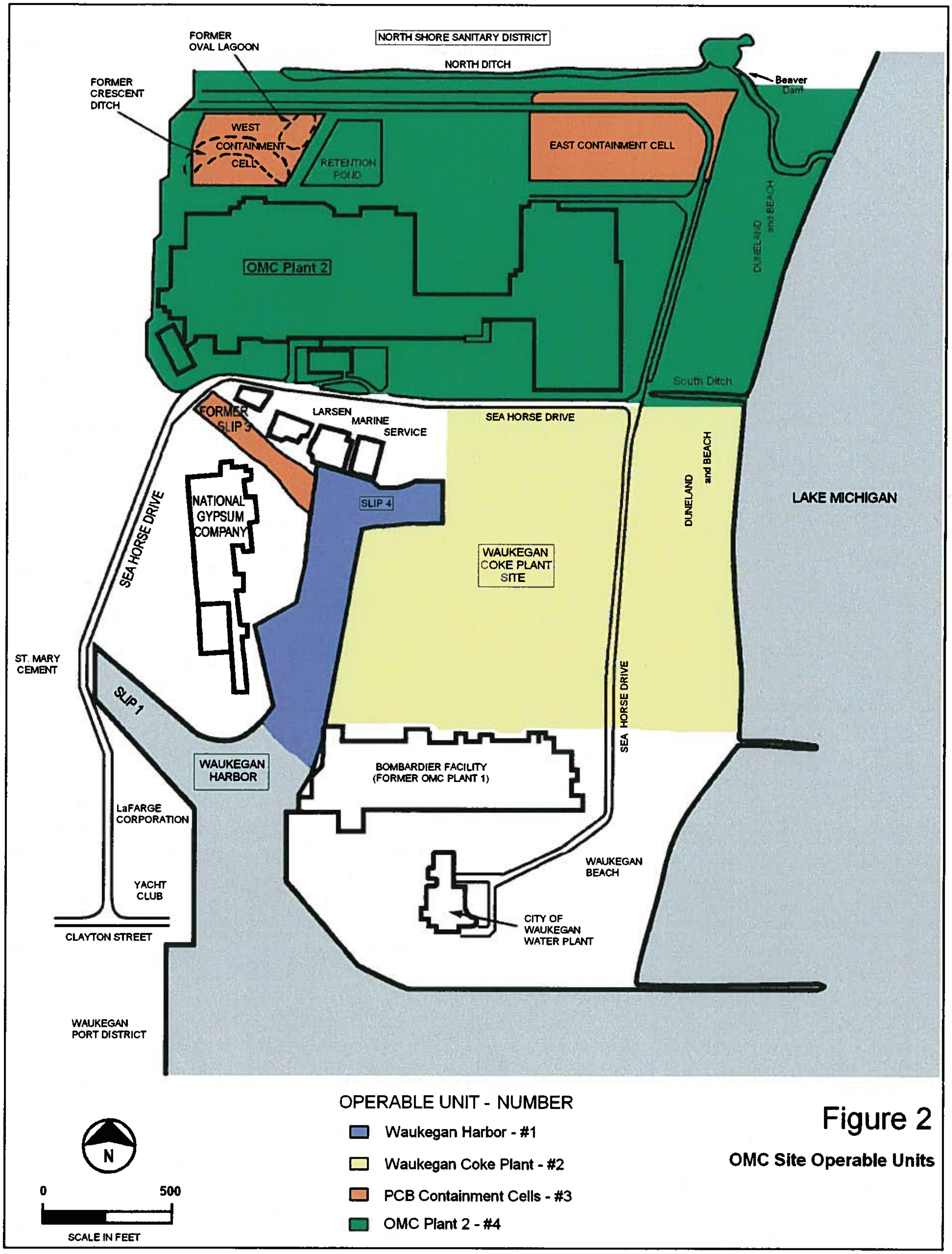


Figure 2

OMC Site Operable Units

B. Site History and Enforcement Activities

1. Site History

The OMC Plant 2 site contains an abandoned 1,060,000 square-foot (ft^2) industrial facility in which OMC made outboard motors from about 1948 until December 2000. The facility used PCB-containing hydraulic and lubricating oils in its production lines beginning in about 1961 until 1972 and routinely discharged some of the fluids into holding lagoons or ponds located just outside. Poor housekeeping led to extensive PCB contamination inside a large portion of the facility. Fluids were also discharged via sewer lines into Boat Slip #3 in Waukegan Harbor, thereby becoming the source of very high-level PCB contamination in harbor sediment. OMC also operated several vapor degreasers at the OMC Plant 2 facility to clean newly made parts with trichloroethylene (TCE). Leaking degreasers and/or TCE storage tanks over the years created a widespread TCE groundwater contaminant plume and a sizeable DNAPL deposit of TCE beneath the site.

Cleanup work at the OMC site began in the early 1980s right after Superfund was passed into law. The State of Illinois had documented PCB contamination in Waukegan Harbor in the mid-1970s and was able to trace it back to the OMC Plant 2 facility. The very high-level harbor sediment PCB contamination led U.S. EPA to place the OMC site on the interim NPL as the state's top priority site in October 1981. We completed a Hazard Ranking System scoring package and proposed the OMC site for the first NPL on December 30, 1982 (*Federal Register* (FR) V.47, No. 251, 58476) with final rule listing of the site occurring on September 8, 1983 (FR V.48, No. 175, 40674). The effective date of NPL listing was 30 days following FR publication.

The U.S. EPA issued a Record of Decision (ROD) in 1984 to clean up Waukegan Harbor sediment after documenting very high PCB contaminant levels in the sediment as well as on the OMC Plant 2 facility grounds. We reached an agreement with OMC in a consent decree in 1988 under which OMC was to perform the cleanup actions selected in the 1984 ROD. After OMC completed the remedial design and U.S. EPA issued a ROD amendment in 1989 to modify the 1984 cleanup approach, OMC cleaned up Waukegan Harbor in 1990-1992 by dredging the north harbor area (see Figure 2) to achieve a 50 milligram per kilogram (mg/kg or "parts per million" (ppm)) PCB cleanup level. OMC converted harbor Boat Slip #3 into a (PCB) containment cell and placed some of the dredged material into the former slip. Prior to placement, sediment containing greater than 500 ppm PCBs was thermally treated to recover the PCB oil for off-site destruction. Over 30,000 gallons of PCB oil was collected and destroyed.

OMC also excavated PCB-laden soils on the north side of its OMC Plant 2 property to achieve the 50 ppm PCB cleanup level and placed these soils into two newly created PCB containment cells ("west containment cell" and "east containment cell" – see Figure 2) located on the north side its OMC Plant 2 facility. Treated harbor sediment was also placed into the west and east containment cells. OMC operated and maintained the three PCB containment cells until December 2002 (when it abandoned its Waukegan facilities during bankruptcy proceedings).

OMC constructed Boat Slip #4 in the harbor in 1990 to replace former Boat Slip #3 (which was being used by Larsen Marine Service as its harbor slip) as a part of the 1990-1993 harbor cleanup action. Some of the soils excavated from Boat Slip #4 contained creosote and other polyaromatic hydrocarbons (PAHs), leading to the discovery of the adjacent Waukegan Coke Plant site on OMC-owned property (see Figure 2). At this point U.S. EPA broke the OMC site up into operable units to efficiently address site environmental problems. Waukegan Harbor was designated as OU #1, the Waukegan Coke Plant site as OU #2, and the PCB containment cells as OU #3. U.S. EPA completed a remedial investigation and feasibility study (RI/FS) in February 1999 at the Waukegan Coke Plant site and issued a ROD for the site in September 1999. Several former owner/operator potentially responsible parties (PRPs), but not OMC, are now cleaning up the Waukegan Coke Plant site under a consent decree with U.S. EPA oversight.

The City of Waukegan purchased the Waukegan Coke Plant property from bankrupt OMC in July 2002. After OMC was permitted to legally abandon the OMC Plant 2 property in December 2002, the City began proceedings to acquire that property as well, completing the acquisition in December 2005. After OMC abandoned the OMC Plant 2 property, U.S. EPA and Illinois EPA performed the operation and maintenance tasks for the PCB containment cells until mid-2005, when the City agreed to assume limited responsibility for this work under a consent decree. We also designated the abandoned OMC Plant 2 site as OU #4 of the OMC site.

2. Enforcement

The United States, on behalf of U.S. EPA, filed a complaint in federal court against OMC under the Clean Water Act and other statutes with regards to PCB contamination in Waukegan Harbor sediment in 1978. The complaint was amended in 1982 to seek relief under CERCLA. The U.S. EPA negotiated a Waukegan Harbor cleanup consent decree with OMC in 1988. In September 2000 we issued a special notice of liability to OMC and identified it as one of several PRPs for the Waukegan Coke Plant site. OMC was not a signatory to the 2004 cleanup consent decree for the Waukegan Coke Plant site, however, because it had filed for bankruptcy protection in December 2000.

OMC is the sole PRP for the OMC Plant 2 site. Because OMC had filed for bankruptcy protection, the United States, on behalf of U.S. EPA, filed a proof of claim in bankruptcy court in 2001 citing the potential cleanup costs of extensive environmental contamination at the OMC Plant 2 site and at other OMC-owned sites in the region. The United States and the OMC bankruptcy estate agreed to settle part of the OMC Plant 2 claim in 2005 and the estate made a payment (less than 10% of the estimated future OMC Plant 2 site cleanup costs) into a Superfund Special Account for use in cleaning up groundwater contamination at the OMC Plant 2 site. The rest of the claim was settled when the estate made additional payments to U.S. EPA in 2006 and 2008.

3. Previous OMC Plant 2 Site Cleanup Actions

a. **Removal Actions**

The U.S. EPA has conducted several time critical removal actions to stabilize and secure the OMC Plant 2 site since the summer of 2002. After the OMC bankruptcy estate petitioned the court to abandon the site in July 2002, we inspected the facility and then filed an objection to the proposed abandonment. We negotiated a cleanup agreement in an administrative order on consent (AOC) with the bankruptcy trustee under which the trustee performed several cleanup tasks at the facility under the oversight of our removal program. The trustee decontaminated machinery, disposed of hazardous chemicals being stored in the facility, drained electrical transformers of PCB-oils, and paid a small sum of money into the Hazardous Substance Trust Fund (Superfund) to cover future site removal action cleanup work by U.S. EPA. After the agreed-upon work was completed, the bankruptcy court approved the abandonment of the site in December 2002.

After the OMC Plant 2 property was abandoned, U.S. EPA immediately began a time critical removal action to further stabilize and clean up the site. We secured broken windows and doors to prevent trespasser access, disposed of additional chemical compounds, attempted to decontaminate PCB-contaminated concrete floors, and removed and disposed of mercury-containing light switches. We also assumed responsibility for the operation and maintenance of the PCB containment cells (OU #3) for a one-year period until December 2003, when Illinois EPA assumed responsibility for this work.

In January 2006, U.S. EPA began a removal action in the sand dune area near the east containment cell because high levels of PCBs were found in the sands outside the cell. We excavated over 6,000 cubic yards (yds^3) of sand containing 10 to 14,000 ppm PCBs and disposed of the sand off-site. We also cleaned out several storm sewers leading from the OMC Plant 2 facility to prevent recontamination of the beachfront by residual PCBs discovered in the sewer lines. In January 2007 we undertook a final removal action to dispose of about 25 PCB-containing electrical transformers at the facility to prevent vandals from breaking the transformers open and dispersing PCBs into the environment. We also removed an extensive amount of copper wire and electrical connectors from the plant to reduce the incentive for scavengers to break into the facility and expose themselves to PCB contamination while scavenging for copper.

In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), U.S. EPA conducted all removal actions consistent with the final remedial actions for the site (40 CFR §300.400(b)(5)(ii)). For example, the removal actions taken inside the abandoned plant did not address all PCB contamination in the building. The remainder will be addressed under the remedial action selected in the first ROD for the OMC Plant 2 site (see next section). Similarly, the removal action conducted in the sand dune area did not achieve the final selected remedial action cleanup level but only mitigated the very high levels of PCBs in the sands, with the remainder to be addressed as a remedial action as well.

b. **Remedial Actions**

The U.S. EPA began a remedial investigation (RI) at the OMC Plant 2 site in 2004 to determine the nature and extent of contamination in site groundwater, sediment, and soil and within the OMC Plant 2 building. We issued the *Remedial Investigation Report (for) OMC Plant 2* containing the study results and a human health and ecological risk assessment in April 2006. We began a feasibility study (FS) in 2005 to examine site cleanup alternatives designed to protect human health and the environment and issued the *Feasibility Study Report (for) OMC Plant 2* in December 2006.

The U.S. EPA, in consultation with the Illinois EPA, issued a proposed plan for cleanup of the contaminated building and soil media at the OMC Plant 2 site in December 2006. After the 30-day public comment period expired we signed a ROD in September 2007 that selected cleanup remedies for these media. Illinois EPA concurred with the selected remedy. We also began to design the selected remedial actions in September 2007 and completed this task in June 2008. Construction of the selected remedies is planned for spring 2009.

The U.S. EPA began an on-site groundwater pilot study test at the OMC Plant 2 site in March 2006. We tested two methods of enhanced *in situ* bioremediation of the TCE contaminant plume at the site and we conducted a column study test for TCE DNAPL destruction in an off-site laboratory. The results of these successful tests were used to update the FS with regards to groundwater and DNAPL cleanup methods and costs to help select cleanup remedies for these media in this ROD. We issued the updated FS in August 2008.

C. Community Participation

The U.S. EPA, in consultation with Illinois EPA, issued a proposed plan fact sheet for cleanup of the OMC Plant 2 site to the public for review and comment in August 2008. We placed the proposed plan and other site documents into the Administrative Record file and the information repository maintained at the U.S. EPA Records Center (U.S. EPA Region 5, 77 W. Jackson Blvd., Chicago, IL) and at the Waukegan Public Library (128 N. County St., Waukegan, IL). We placed two notices (one in English and the other in Spanish) of the availability of the proposed plan and other documents in the Waukegan *News-Sun*, an area newspaper of wide circulation, in August 2008. We also printed the proposed plan in Spanish and brought copies to area churches for distribution to parishioners.

The U.S. EPA opened a public comment period on the OMC Plant 2 site proposed plan from August 2, 2008 to October 2, 2008. We held a public meeting on August 14, 2008 at Waukegan City Hall to present the proposed plan and take public comments. We answered questions about the actual or potential health risks posed by contaminants at the site and the remedial alternatives that we evaluated in response to the health risks. Our responses to public comments received during the comment period are included in the Responsiveness Summary section of this Record of Decision. Initially, the public comment period was slated to run until September 2, 2008; however, the City of Waukegan requested and was granted a 30-day extension of the comment period until October 2, 2008.

The U.S. EPA has attended many meetings of the Waukegan Community Advisory Group (CAG) over the past several years to help keep the CAG updated on the many cleanup actions and investigations at the OMC site. We attended a CAG meeting on August 19, 2008 to discuss the OMC Plant 2 groundwater and DNAPL proposed plan and answer questions about the proposal. We have also met periodically with City officials to discuss the OMC Plant 2 site, provide updates on cleanup action progress, and to remain up-to-speed on the City's plans for future redevelopment of the OMC site.

D. Scope and Role of the Response Actions

1. <u>OMC Plant 2 (Operable Unit #4)</u>

The U.S. EPA identified four media of concern in which chemical contaminants may exceed human health or ecological risk-based cleanup levels at the OMC Plant 2 site. The media are:

- Soil and sediment
- OMC Plant 2 building
- Groundwater
- DNAPL

The September 2007 ROD (referenced in Section B.3.b., above) sets forth the selected cleanup methods for the PCB- and PAH-impacted soil and sediment and the PCB-impacted building media. The U.S. EPA will clean up the building media by demolishing the facility and excavating the soil and sediment and then disposing of the debris into appropriate off-site landfills. We have completed the remedial design phase for these actions and cleanup construction is planned to begin in about April 2009 and be completed by September 2010.

This ROD contains the selected cleanup methods for OMC Plant 2 site groundwater and DNAPL media. Ingestion of water extracted from the contaminated aquifer poses a potential risk to human health because U.S. EPA's acceptable risk range is exceeded and concentrations of contaminants are greater than the maximum contaminant levels for drinking water (as specified in the Safe Drinking Water Act). One of the response actions herein also addresses a principal threat waste through *in situ* treatment of the TCE DNAPL in the aquifer beneath the site. We anticipate that the groundwater and DNAPL remedies will be the final cleanup actions that we select for contaminated media at the OMC Plant 2 site.

The U.S. EPA plans to immediately begin the remedial design phase for the groundwater and DNAPL cleanup actions. This phase will take about 8 months to complete; thus, we plan to initiate and complete construction of the cleanup actions in 2010. At that point all projected cleanup construction work would be completed for the OMC Plant 2 site.

2. <u>OMC Site (Operable Units #1, #2, #3)</u>

The OMC Plant 2 site is the fourth of four operable units of the OMC NPL site. With regard to the other three operable units, cleanup construction work was completed at the Waukegan Harbor site (OU #1) in 1993. However, U.S. EPA has issued a proposed plan for ROD Amendment in November 2008 to address residual PCB contamination in the harbor sediment. Remedy selection is anticipated in spring 2009 and we plan to complete the design phase for the new response action in late 2009 or early 2010.

The Waukegan Coke Plant site (OU #2) has two media of concern – soils and groundwater. Soils cleanup work was completed at the site in 2005 and construction of the groundwater remedial action was completed in November 2008. U.S. EPA estimates that the active operation and maintenance effort for the groundwater cleanup will run between three and eight years, after which time the site will enter into a monitored natural attenuation (MNA) phase for several decades or more.

The operation and maintenance phase is underway for the three PCB containment cells (OU #3) and no further response actions are planned. Thus, completion of construction of the selected cleanup remedies for the OMC Plant 2 site (OU #4) and the new harbor cleanup action to be selected in early 2009 will be the final cleanup remedies for the OMC NPL site.

E. Site Characteristics and Investigation Results

The OMC Plant 2 site is a 60-acre industrial property located on the lakefront in Waukegan, Illinois (see Figure 3, next page). The site is bordered by the North Shore Sanitary District (NSSD) to the north, Lake Michigan to the east, Sea Horse Drive and

Waukegan Harbor to the south, and E.J. & E. Railway tracks to the west. The North Ditch drains upland (off site) areas and runs along the NSSD border towards Lake Michigan until it makes a sharp turn to the south very close to the lake. The lakefront side of the site is emergent dune land and beachfront. Lake levels have generally decreased since the 1980s and wave action has deposited significant amounts of sand from northern sources, thereby increasing the amount of emergent dune land along the lake. Except for the North Ditch, there are no existing wetlands on the site.

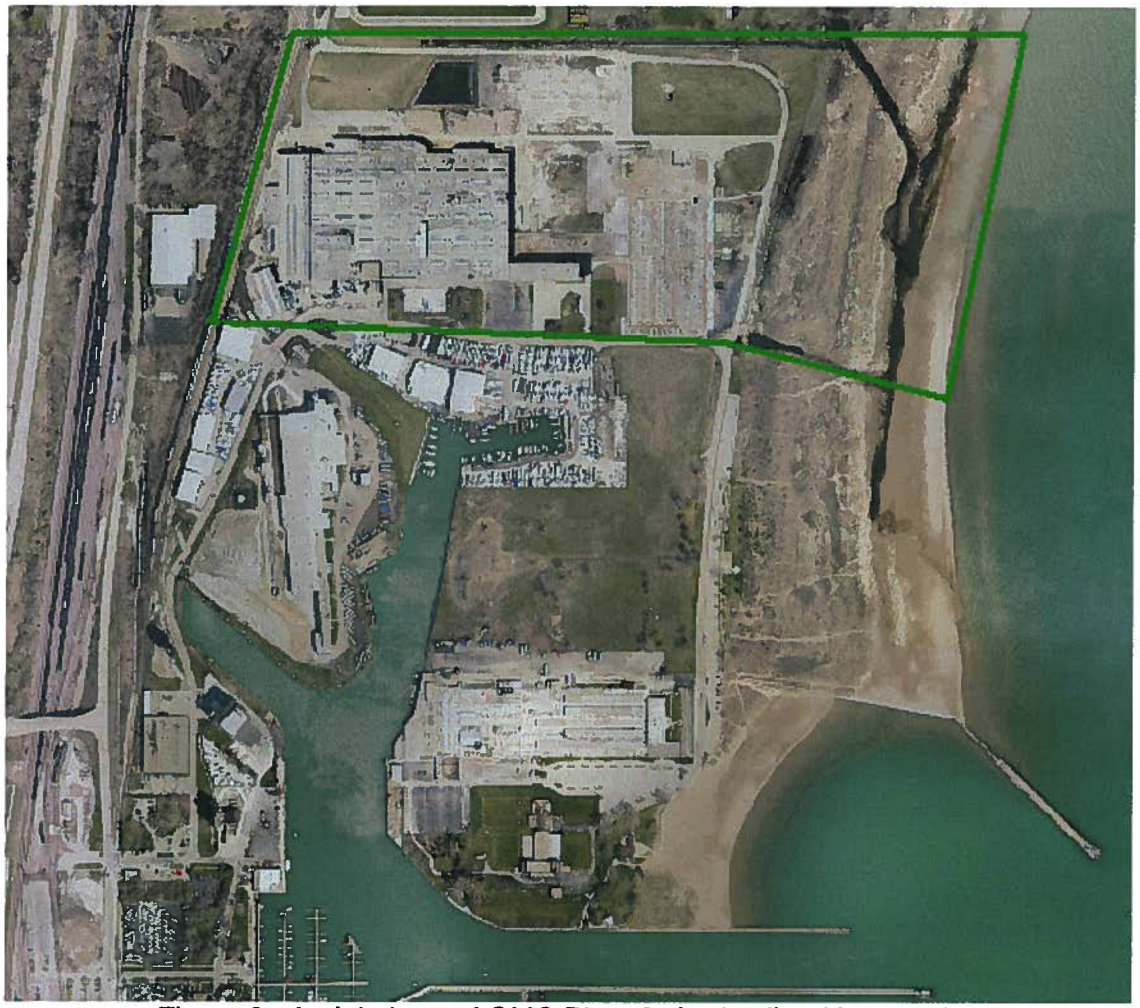


Figure 3: Aerial photo of OMC Plant 2 site (outlined in green)

OMC manufactured outboard motors from about 1948 until 2000 in the 1,060,000 ft^2 OMC Plant 2 facility. OMC used PCB-containing hydraulic and lubricating oils in its production line machinery beginning in 1961 until 1972 and allowed some of the oils to empty into floor drains. The floor drains emptied into sewer lines that discharged into (former) Boat Slip #3 and the former Crescent Ditch and Oval Lagoon (Figure 2) site features. Runoff from the Crescent Ditch and Oval Lagoon fed into the North Ditch. OMC Plant 2 thus was the source of PCB contamination in Waukegan Harbor sediment (via the Boat Slip #3 outfall) and likely a source of PCB contamination in Lake Michigan (via the Oval Lagoon, Crescent Ditch, and North Ditch drainage system). The Oval Lagoon and Crescent Ditch were covered or filled in as a result of the 1990-1992 harbor cleanup action and no longer exist. The west containment cell now occupies the land in their place.

OMC operated several vapor degreasers at the OMC Plant 2 facility to clean newly made parts with trichloroethylene (TCE). Leaking degreasers and/or TCE storage tanks have created a widespread TCE groundwater contaminant plume and an isolated dense, non-aqueous phase liquid pool of TCE (DNAPL) beneath the site.

Before U.S. EPA began the RI/FS at the site in 2004 we gathered existing site environmental information and mapped out a sampling strategy based on the following known facts or criteria:

- The 1984 ROD/1989 ROD amendment for the OMC site selected a PCB cleanup level of 50 ppm in Waukegan Harbor sediment and in soil near the then-active OMC Plant 2 facility; currently, U.S. EPA's cleanup goal for PCBs is usually set at 1 ppm or less for residential soil cleanups;

- OMC had determined that its OMC Plant 2 facility was sitting over extensive groundwater contamination (TCE and its breakdown products) based on sampling work and reports it had commissioned in the 1990s;

- OMC had numerous RCRA-permitted chemical storage units on site, some of which it had removed or closed before its declaration of bankruptcy in December 2000;

- The groundwater aquifer beneath the site is a 20-30 foot layer of sand deposited on a thick layer of clay or "hardpan;"

- The OMC Plant 2 building was likely impacted by PCB contamination inside based on PCB-usage records and the general 'filthy' appearance of the soon-to-be abandoned facility in mid-2002; and

- OMC did not use asbestos-containing material in its manufacturing processes.

Based on the information we gathered at the OMC Plant 2 site, the known or suspected sources of site contaminants included:

- Drainage lines containing PCB-laden hydraulic and cutting oils;
- Vapor degreasers using TCE; and
- Other storage units previously containing paints or fuels.

Thus, our sampling plan for the OMC Plant 2 site included the following tasks:

- Take wipe samples of interior building surfaces for PCB analysis;
- Take surface and subsurface soil samples for PCB, volatile organic compound (VOC), semi-volatile organic compound (SVOC), and metals analyses;
- Obtain core samples of interior concrete for PCB analysis;
- Use direct-push technology to determine the nature and extent of groundwater contamination prior to taking groundwater samples for PCB, VOC, SVOC, and metals analyses;
- Take samples of DNAPL (if found) for PCB, SVOC, and VOC analyses; and
- Take measurements of indicator compounds in the groundwater to determine whether monitored natural attenuation can be a viable management approach for the site.

Our sampling plan was crafted to yield data that would help us determine actual or potential risks to human health and the environment based on current and projected uses for the site. Currently, human receptors use the beachfront and dunes areas on a recreational basis and trespassers or scavengers periodically access the abandoned building. Ecological receptors also frequent or live in the beachfront and dunes areas. No one is currently using groundwater at the site. Future residential receptors would be using the site if the City's redevelopment plans come into fruition.

Our RI sampling results both confirmed OMC's previous groundwater contamination mapping efforts and showed more widespread areas of contaminants than previously known. As a result, we identified four media of concern at the site (discussed below).

Soil and Sediment

OMC had also excavated soil around the OMC Plant 2 facility as part of the 1990-1992 Waukegan Harbor cleanup action and the selected cleanup level for PCBs in the soil was 50 ppm based on the projected future industrial use of the site. U.S. EPA's 2004-2006 RI sampling results showed pervasive, low levels (between 1 and 50 ppm) of PCBs and PAHs in site soil and in sediment in the North Ditch and no extensive areas with high levels (greater than 50 ppm) of PCBs or PAHs.

The U.S. EPA selected a cleanup remedy for soil and sediment in the September 2007 ROD in anticipation that the site would be redeveloped in accordance with the City's lakefront redevelopment plans. We had calculated that about 40,000 yds^3 of soil and sediment exceeded the 1 ppm and 2 ppm cleanup levels for PCBs and PAHs, respectively; of that amount, about 1500 yds^3 exceeded 50 ppm PCBs. All soil and sediment exceeding the cleanup goals will be excavated and disposed of off-site.

OMC Plant 2 Building (Interior)

Much of the OMC Plant 2 building is contaminated with PCBs on interior surfaces. Concrete floors, abandoned machinery, and porous and nonporous wall and ceiling surfaces showed levels of PCBs from non-detect (ND) to 750 µg/100 cm^2. (The Toxic Substances Control Act (TSCA) screening criterion for PCBs is 10 µg/100 cm^2.) About 620,000 ft^2 of building space are impacted by PCBs above the TSCA screening level. The remainder of the building was not contaminated and the City of Waukegan demolished about 400,000 ft^2 of uncontaminated structures down to the concrete slabs beginning in August 2006. The City demolished the concrete slabs in summer 2008 and removed the debris off site in fall.

The U.S. EPA selected a cleanup remedy for the PCB-contaminated building in the September 2007 ROD in anticipation that the site would be redeveloped in accordance with the City's lakefront redevelopment plans. We will demolish the remainder of the building and dispose of PCB-contaminated debris in off-site facilities.

Groundwater and DNAPL

Groundwater sampling detailed a large contaminant plume beneath the OMC Plant 2 site that primarily consists of dissolved TCE and its breakdown products (vinyl chloride and *cis*-1,2-dichloroethylene (*cis*-1,2-DCE)). The presence of *cis*-1,2-DCE and vinyl chloride, along with other parameters such as dissolved oxygen levels, indicates that a significant amount of anaerobic bacterial degradation of the TCE is naturally occurring at the site. Some areas of the plume have groundwater TCE and vinyl chloride levels exceeding 10,000 micrograms per liter (µg/L or "parts per billion" (ppb)) and *cis*-1,2-DCE as high as 250,000 ppb. In comparison, target cleanup levels for TCE and vinyl chloride at other Superfund sites approach 1-5 ppb or less. Arsenic was also found to be present in some groundwater samples taken from under the site, although the highest concentrations were found close to or on the adjacent Waukegan Coke Plant (OU #2) site boundary. Arsenic is a COC at the Waukegan Coke Plant site.

An estimated 134,000 kilograms (kg) (295,000 pounds) of TCE is found as a DNAPL that lies on the clay surface about 30 feet below ground surface. The DNAPL is a continual source of dissolved TCE contamination to the groundwater beneath the site and we consider it to be a principal threat waste (please see Section K for a discussion of how U.S. EPA expects to manage principal threat wastes at Superfund sites).

1. <u>Geology and Hydrogeology</u>

From surface to depth the ground materials encountered at the OMC Plant 2 site consist of a 2-12 foot layer of fill overlying a poorly graded, silty to gravelly sand aquifer (see Figure 4, next page). The fill material is comprised of a mix of silty clay, gravel, sand and contains fragments of wood, brick and other debris. The aquifer is

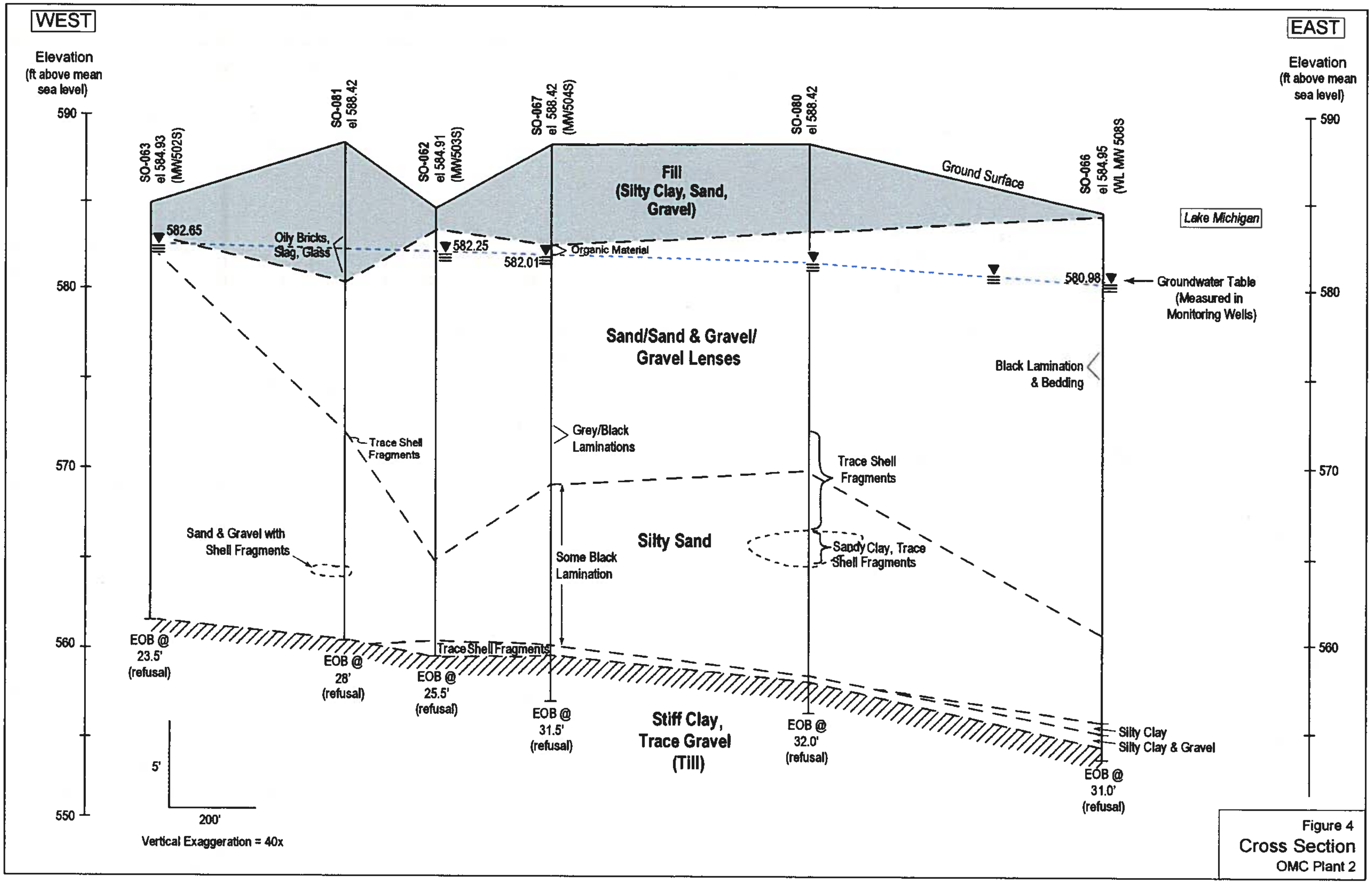


Figure 4: Typical cross-section of OMC Plant 2 site

unconfined and has an average hydraulic conductivity of 2 x 10^{-2} cm/sec and an average porosity of 30 percent. Beneath the sand aquifer is a 70-80 foot layer of hard gray clay or glacial till that gently slopes downward from west to east (towards Lake Michigan). Hydraulic conductivity of the clay layer is estimated to be about 1 x 10^{-7} cm/sec, making this layer an effective aquitard (a barrier to movement of groundwater). The fill, sand, and clay layers regionally overlie very old dolomite bedrock formations that are not, however, encountered at the site.

Groundwater is encountered at depth between 2 and 7 feet at the site, depending on location and weather. Localized heavy rainfall will tend to quickly raise the water table until conditions equilibrate with Lake Michigan and/or the harbor water levels. Water level measurements taken in shallow and deep monitor wells installed in the sand aquifer show that there is little or no difference in vertical gradients between wells, meaning that the aquifer tends to act as a whole when stressed. Horizontal gradients measured in shallow wells show that groundwater tends to flow towards the lake along the northern portions of the site and towards the harbor from the southern portions of the site (see Figure 5, next page). Average linear velocity is estimated to be 75-150 feet/year. Deeper groundwater moves similarly, but at lesser average flow velocities.

2. <u>Extent of contamination</u>

Groundwater samples were taken and analyzed for VOCs and other parameters from shallow-screened and deep-screened wells at the site. Figure 6 provides a view of the general extent of chlorinated VOC contamination at the site. The major contaminants are TCE, vinyl chloride, and *cis*-1,2-DCE. As seen, a large portion of the site has groundwater VOC levels above 1 ppb. The U.S. EPA has identified five locations that exhibit very high levels of dissolved contaminants into the milligram per liter (mg/L or "parts per million (ppm)) range. Termed "source areas," these locations are presented in Figure 7, which also presents the location of the TCE DNAPL.

The plume dimensions illustrate the general groundwater flow directions, i.e., to the east on the northern portion of the site and towards the harbor on the southern portion of the site. As seen on Figure 6, VOCs appear not to be discharging into Lake Michigan or entering the harbor as yet. This is evidence that significant natural attenuation of contaminants is already occurring at the site because the TCE contaminant plume likely has been under the site for several decades, yet no measurable levels of site VOCs can be detected entering the lake or harbor waters.

U.S. EPA sampled the indoor air in one of the Larsen Marine Service (Larsen) buildings in the winter of 2005 to check if there was an indoor air intrusion problem at Larsen, but we did not detect any of the OMC Plant 2 site VOCs in our results.

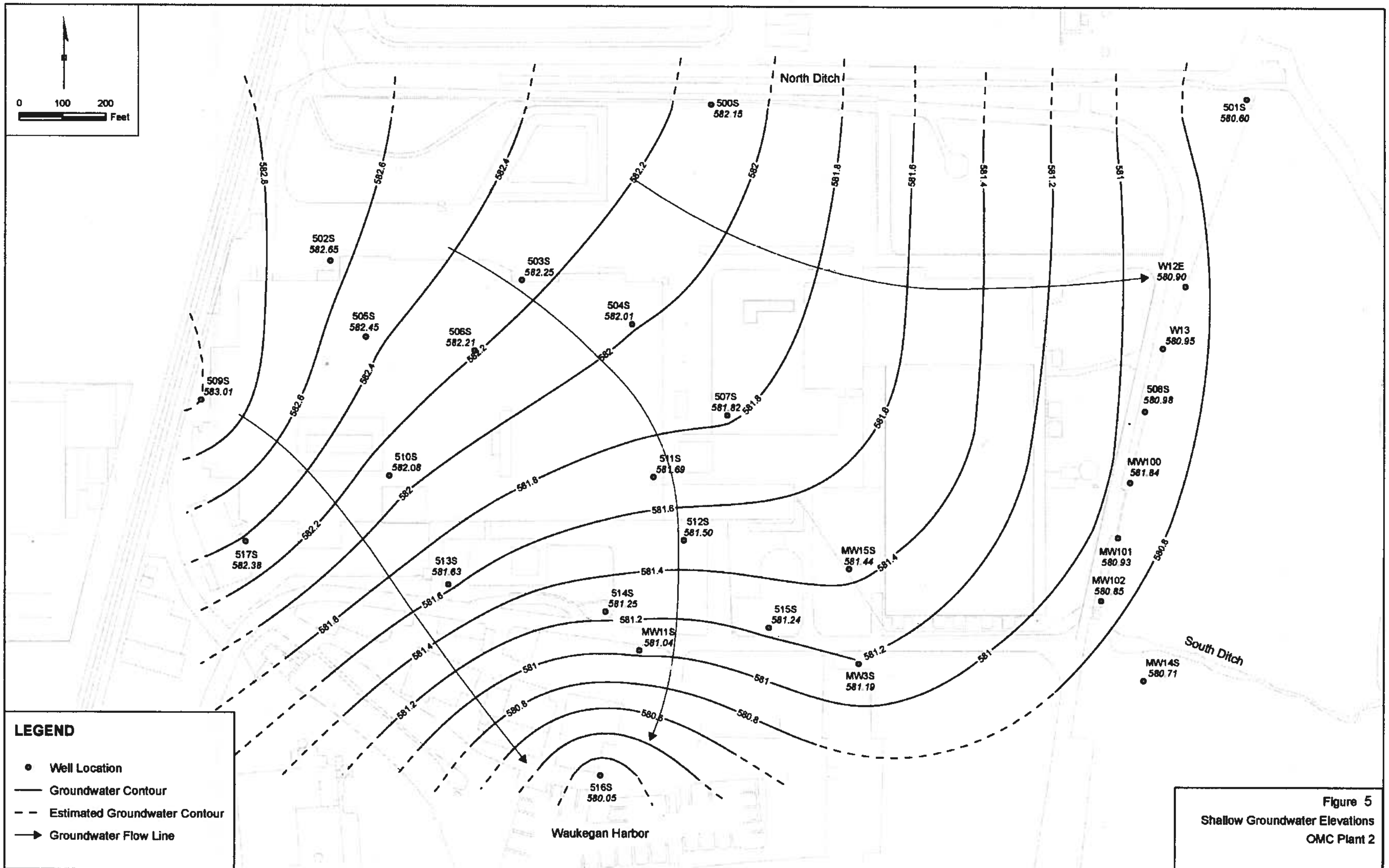


Figure 5: Water table level contours for OMC Plant 2 site

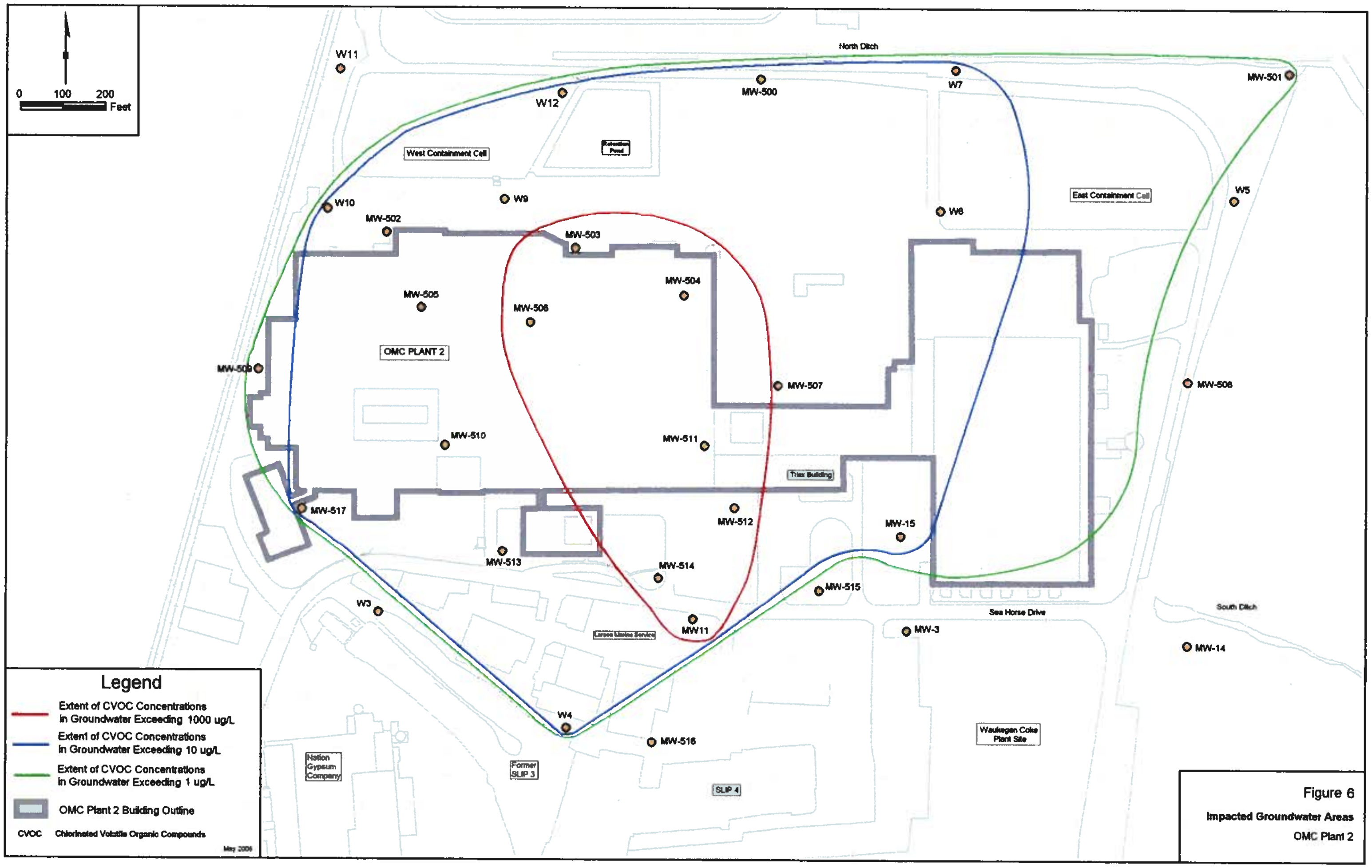


Figure 6: Extent of VOC contamination in groundwater

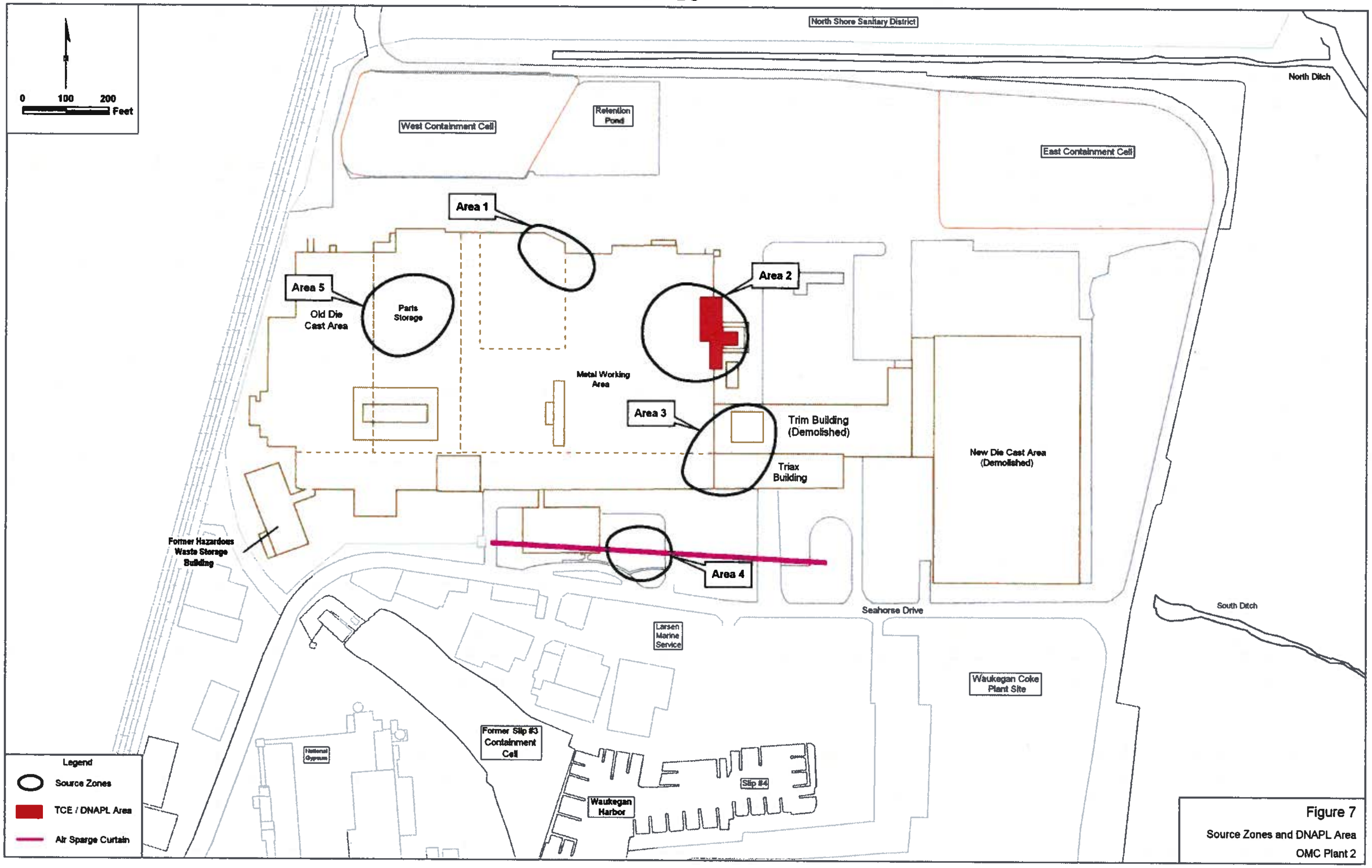


Figure 7: Locations of Source Areas and DNAPL

3. Conceptual Site Model

Figure 8 presents the conceptual site model for the groundwater and DNAPL media at the OMC Plant 2 site. The DNAPL presents a continuous source of dissolved contamination to the groundwater and also is a potential future source of VOC contamination to indoor air by volatilization. The DNAPL, however, is too deep to present a dermal contact or ingestion hazard. The groundwater presents a potential ingestion and dermal contact threat to human health, although there are no potable wells on the site and no one is drinking or otherwise using the contaminated water. The VOCs could also volatilize from the groundwater into indoor air.

F. Current and Potential Future Land and Resource Uses

The OMC Plant 2 site is currently zoned commercial-industrial and other commercial-industrial properties surround the site. However, the adjacent Waukegan Coke Plant site (OU #2) has already been rezoned by the City to high-density residential in anticipation of redevelopment of this site in the near future. With its location next to Lake Michigan and Waukegan Harbor, U.S. EPA expects that the OMC Plant 2 site could also be rezoned to high-density residential consistent with the City's lakefront redevelopment plans. The City has published its master plan for redevelopment (see Figure 9) on its website and officials have stated that in another 15-20 years perhaps "8000-10,000 people" will be living on the lakefront where no residents are living now. Alternatively, the existing OMC Plant 2 building could be re-used industrially should the City's current plans for redevelopment be significantly delayed or revised.

Groundwater is not used for potable purposes in the OMC site area (as a whole) because the City obtains its municipal water supply from Lake Michigan (see Figure 2 for location of the City's water plant). Given the existing municipal water system, we do not anticipate that groundwater would be used as a source of drinking water in the future. If the site groundwater was free of OMC-derived VOC contaminants, however, it could be potentially used as a drinking water source.

G. Summary of Site Risks

The U.S. EPA generally follows a four-step process for preparation of the baseline human health risk assessment (HHRA) at Superfund sites:

1. Identify chemicals of concern (COCs);
2. Conduct an Exposure Assessment for COCs;
3. Conduct a Toxicity Assessment of COCs; and
4. Characterize Risk and Evaluate Uncertainties.

The U.S. EPA evaluated the levels of chemicals found in the OMC Plant 2 site groundwater and DNAPL media to determine the actual or potential risks to human

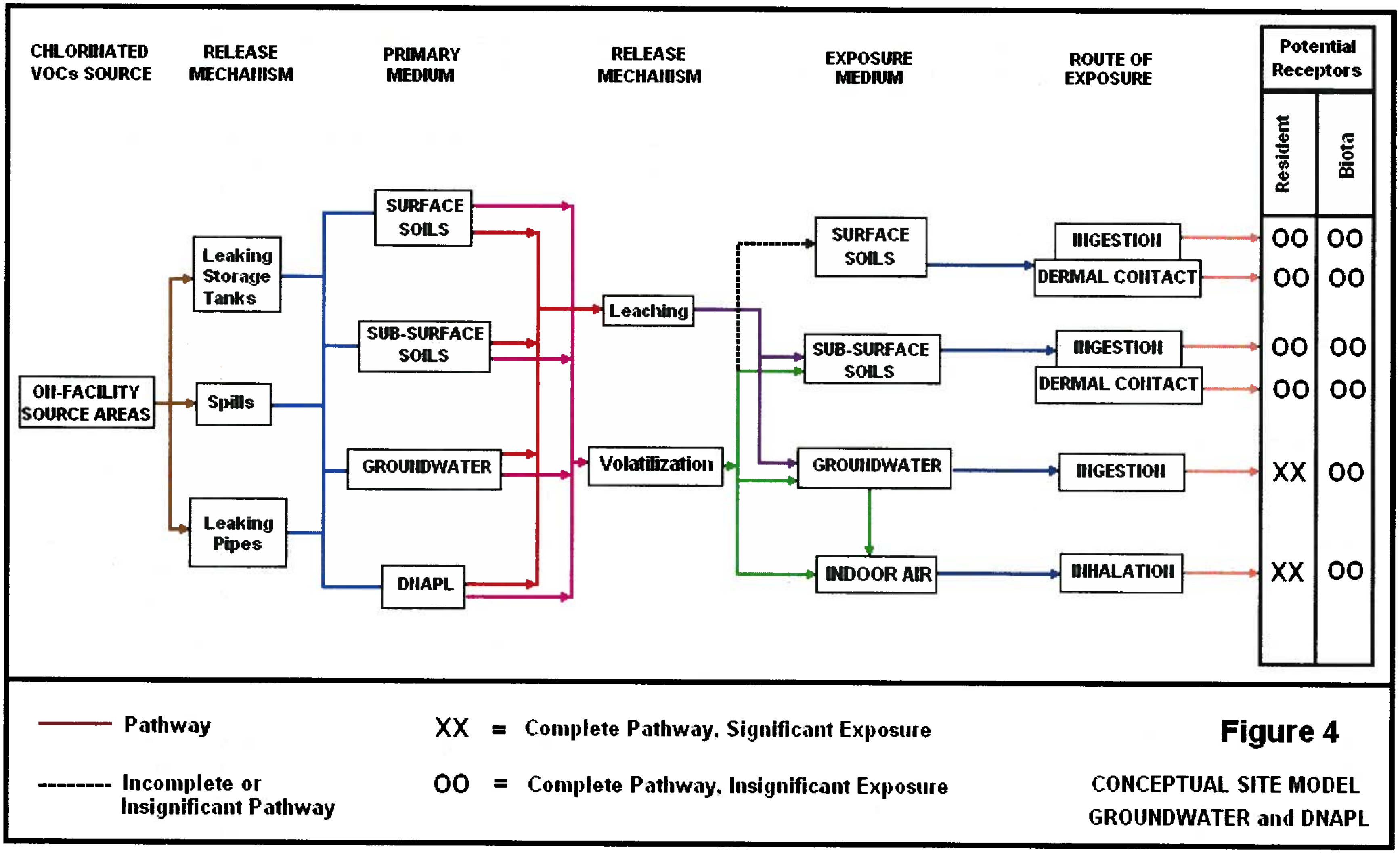


Figure 8: Conceptual Site Model for OMC Plant 2 Groundwater and DNAPL

health and the environment. As stated above, the first step we took was the identification of "chemicals of potential concern" (COPCs) - those compounds that exceeded health-based levels at the site - using screening levels or preliminary remediation goals published by the State of Illinois and/or U.S. EPA. We then narrowed down the list of COPCs to "chemicals of concern" (COCs) – those compounds that are most pervasive at the site or most representative of a chemical class.

We next evaluated chemical fate and transport factors to determine whether the COCs were potential short-, medium-, or long-term risks at the site and then we examined potential pathways of concern to human health and the environment under current and future site-use scenarios in an exposure assessment. We applied the results of the above steps to quantify actual or potential risks to human health and the environment by combining exposure level assumptions with estimated carcinogenic risk or toxicity factors for the COCs. The human health and ecological risk assessment work is fully presented in the RI Report for the OMC Plant 2 site. We have placed the RI Report into the Administrative Record for the site.

1. Chemicals of Concern

Chemicals of concern (COCs) are contaminants that potentially present the greatest human health concerns (*i.e.*, those present in the highest concentrations, with the widest distribution over the site, or that exhibit the highest mobility or the highest toxicity). Environmental sampling efforts may identify many chemical compounds, whether naturally-occurring or not, at a site at varying concentrations. Thus, the purpose of identifying COCs is to focus the risk assessment on the most important contaminants found at a site.

The U.S. EPA identified TCE, vinyl chloride, *cis*-1,2-DCE, and arsenic as COCs in OMC Plant 2 site groundwater and TCE in the DNAPL (see Table 1).

Table 1: Chemicals of Concern at the OMC Plant 2 site

Media	**Chemical of Concern**	**Frequency of Detection**	**Highest Concentration**	**Screening Level****
Groundwater	TCE	48 of 93 samples	16,000 µg/L	5 µg/L
Groundwater	Vinyl Chloride	66 of 93 samples	16,000 µg/L	2 µg/L
Groundwater	*cis*-1,2-DCE	74 of 92 samples	250,000 µg/L	70 µg/L
Groundwater	Arsenic	42 of 127 samples	1,430 µg/L	10 µg/L
DNAPL	TCE	One location	(100% free product)	-------

Note: **Maximum Contaminant Level (MCL) under the Safe Drinking Water Act and Tier 1 Groundwater Remediation Objectives under the Tiered Approach to Corrective Action Objectives (TACO)

We found very high levels of the chlorinated volatile organic solvent, TCE, and its breakdown products (such as vinyl chloride) in samples taken from five source areas, mostly located under the building's concrete slab in the western area of the site. Lower levels of these contaminants are found throughout most of the water table aquifer.

Arsenic, a metalloid element, is a COC at the adjacent Waukegan Coke Plant (OU #2) site and the highest dissolved arsenic levels were found in groundwater samples taken from monitoring wells on or near this site. We have labeled arsenic as a COC at the OMC Plant 2 site so that cleanup efforts and goals for arsenic at the OMC Plant 2 site may be coordinated or consistent with the cleanup efforts and goals for arsenic at the Waukegan Coke Plant site.

We also saw scattered detections of BTEX (benzene, toluene, ethylbenzene, and xylene) compounds in site groundwater samples. However, concentrations of the BTEX compounds were not high enough and detections were not pervasive enough for U.S. EPA to consider these organic compounds to be COCs in groundwater at the site.

Fate and Transport

Vinyl chloride, TCE, and *cis*-1,2-DCE are soluble in water and tend not to adhere to soil and sediment particles; thus, the mobility of these compounds is high. The VOCs would continue to move towards the harbor and lake waters along with the groundwater flow. Bioaccumulation can occur in receptors but tend not to biomagnify. These compounds readily break down (biodegrade) under anaerobic conditions and less readily biodegrade under aerobic conditions. However, because the TCE DNAPL presents a large source of dissolved TCE to the groundwater, these COCs, if not addressed, will persist in site groundwater for years to come and would be readily available for people to become exposed to them if the groundwater was used for potable purposes.

Arsenic tends to adhere to clayey soil particles and the mobility of this compound on this media is usually low. However, arsenic is soluble in groundwater and mobility can be moderate to high. Arsenic bioaccumulation is moderately likely to occur in receptors and it does not biodegrade. Given the high levels of arsenic in the adjacent Waukegan Coke Plant site groundwater, this COC, if not addressed, will likely persist in groundwater for years to come and be readily available for people to become exposed to it if the groundwater was used for potable purposes.

2. Exposure Assessment

The baseline HHRA provided an evaluation of the carcinogenic and non-carcinogenic risks due to groundwater contamination and associated with future exposures by residents (adult and child) and construction workers. As shown in the conceptual site model (see Figure 8, above), the potential exposure routes that were quantified include ingestion, inhalation, and dermal contact (through the skin). These routes are associated mainly with potential future exposures by residential users and construction workers because no one is currently using the groundwater at the site. The City plans to redevelop the site within the next ten years or less.

Dermal contact and ingestion pathways for the VOC and arsenic contaminants in soils are not considered to be significant because VOC levels occur at depth in the groundwater and not in surface or near-surface soil.

3. Toxicity Assessment

The U.S. EPA evaluated the relationship between the magnitudes of actual or potential exposure to VOCs in the site groundwater with corresponding adverse health effects. An estimate of the increased likelihood and severity of the adverse effects was calculated and used in the assessment of risk at the site.

Generally, adverse health effects are divided into two categories – non-cancer causing (non-carcinogenic) and cancer causing (carcinogenic). For example, arsenic, TCE, and vinyl chloride are considered to be carcinogenic but also cause noncarcinogenic effects. *Cis*-1,2-DCE is considered to be a non-carcinogen. Risk calculations were performed separately for these VOCs as carcinogens and as non-carcinogens because the adverse health effects are different (*e.g.* cancer-causing versus causing liver failure).

<u>Carcinogenic Effects</u>

Carcinogenic effects are evaluated using reference doses (RfDs) for carcinogens that were developed based on published cancer slope factors extrapolated from animal testing or other means. To calculate risk, TCE and vinyl chloride were assigned toxicity values in accordance with U.S. EPA's Integrated Risk Information System (IRIS). IRIS provides a database of human health effects that may result from exposure to site VOCs as well as from many other chemicals.

TCE and vinyl chloride are human carcinogens that can be inhaled, ingested, or absorbed through the skin, although toxicity values provided by U.S. EPA in IRIS typically reflect doses to study subjects only via inhalation or ingestion exposure. Studies have shown that TCE and vinyl chloride intake can be associated with certain types of cancer such as of the lung, brain, liver, and kidney. Likewise, arsenic is a human carcinogen that can be inhaled, ingested, or absorbed. Studies have also shown that arsenic intake can be associated with certain types of cancer such as of the lung, liver, kidney, bladder, and skin.

Using reasonable maximum exposure (RME) rates based on the results of the exposure assessment, we can calculate an excess lifetime cancer risk (ELCR) value posed by site COCs. An ELCR is an estimate of one's chances of contracting cancer due to lifelong exposure to a chemical at site concentrations and is usually expressed as an exponential value (*e.g.* 1×10^{-2} is 1 in 100).

Non-carcinogenic Effects

Similarly, non-carcinogenic effects are evaluated using reference doses (RfD) developed by U.S. EPA. Reference doses for non-carcinogens are developed on the assumption that certain levels of contaminants may not pose ill effects to the liver or kidney, for example, due to daily exposure at threshold levels over a lifetime of exposure. The RfD for *cis*-1,2-DCE is based on chronic oral exposure studies and is based on the Lowest Observed Adverse Effect Level (LOAEL). Liver damage is a critical health effect caused by ingestion of *cis*-1,2-DCE. Critical health effects caused by arsenic include hyperpigmentation, keratosis, and possible vascular complications.

Combined with the results of the exposure assessment, we are able to calculate the Hazard Index (HI) quotient for a COC. A HI quotient is the ratio of the amount of a non-carcinogenic chemical contaminant that an individual may be exposed to at a site to the amount of the contaminant that causes an adverse toxic reaction within the body. An HI quotient of 1 or more would mean that there is enough contaminant at the site to cause a toxic reaction (likely an adverse impact to the target organs) in a person, if one is exposed to the contaminant. A HI quotient of less than 1 indicates no adverse health effects would be expected due to exposure to a chemical at site concentrations.

4. Human Health Risks

Carcinogenic risk is generally expressed as the incremental increase in the probability of an individual's developing cancer over a lifetime as a result of lifetime exposure to a carcinogen. For example, an ELCR of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure to a carcinogen has a 1 in 1,000,000 (one in one million) chance of developing cancer as a result of site-related exposure to the chemical. Calculated risk values are referred to as an "excess lifetime cancer risks" because the risks would be in addition to the more prevalent risks of cancer that individuals face due to other factors such as smoking or unprotected exposure to too much sunlight. The chance of an individual's developing cancer during ones lifetime from all other causes has been estimated to be as high as 1 in 3 (3.3×10^{-1}).

Excess lifetime cancer risk (ELCR) is calculated from the following equation:

$$ELCR = CDI \times SF$$

where:
ELCR = a unit-less probability (*e.g.*, 1×10^{-2})
CDI = chronic daily intake level (mg/kg-day)
SF = slope factor, expressed as $(\text{mg/kg-day})^{-1}$

Non-carcinogenic health effects are expressed as a Hazard Index (HI) quotient. A calculated HI that is less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely to occur. A total HI quotient can be generated by adding the HI quotient for all site-wide COCs that affect the same target organ (*e.g.*, liver) to which a given individual may reasonably be exposed. An HI that is less than 1 indicates that, based on the sum of all HI's from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures might present a risk to human health.
The HI is calculated as follows:

HI = CDI/RfD

where: CDI = Chronic daily intake (mg/kg-day)
RfD = reference dose (mg/kg-day)

CDI and RfD are expressed in the same units and represent the same exposure period.

<u>Target Risk</u>

U.S. EPA generally cleans up Superfund sites to reduce contaminant levels or exposure to contaminants so that the estimated ELCRs posed by carcinogenic contaminants fall within a risk range of 1×10^{-4} to 1×10^{-6} (1 in 10,000 to 1 in 1,000,000) and/or the calculated HI values for non-carcinogenic compounds fall to less than 1. We may use the term "unacceptable risk" when referring to contaminants at concentrations above levels that yield estimated an ECLR greater than 1×10^{-4} or a HI greater than 1 after a risk assessment is performed.

<u>Uncertainties</u>

Calculated ELCRs and HI values are estimates of potential upper-bound risks that are useful in regulatory decision-making. However, it is improper to consider the risk estimates to be representative of actual risk to potentially exposed individuals because the risks were estimated by making numerous conservative assumptions (that is, assumptions that over-estimate potential exposure levels and thus, potential risk) due to uncertainties inherent in the HHRA process. For example, some exposure and toxicity value assumptions have greater amounts of scientific data supporting them than others (that is, a widely-used chemical may be well-studied whereas a newer compound may not yet have any testing data associated with it). Uncertainty is also introduced into the risk assessment process every time an exposure assumption is made based on current or potential site uses.

One example of uncertainty at the OMC Plant 2 site is related to future groundwater use. Although the impacted aquifer is potentially usable, it is not likely that it would be a future source of drinking water for residents because the City's water supply is drawn from Lake Michigan and is readily available to the area. Thus, assuming consumption of site groundwater may overestimate potential human health risks.

Similarly, potential risks due to exposure to VOCs through indoor air intrusion could over- or underestimate risks. Not all structures that may be built on the site would be impacted at the same rate of infiltration. Also, U.S. EPA may require the City to mandate that vapor barriers or mitigation devices be engineered into new structures to prevent potential indoor air intrusion problems. These systems may work well or not at all, thereby creating uncertainty in risk calculations.

Most importantly, the cancer-slope factor for TCE is under review by health experts and could be reset at a level 65 times higher than the slope factor used to estimate human health risk in the RI Report. This would result in the estimated cancer risk for exposure to TCE in site groundwater being underestimated by a factor of 65.

HHRA Results

The U.S. EPA used an exposure point concentration for VOCs and arsenic using a central tendency exposure (CTE) scenario to estimate human health risk at the site. The term "CTE" refers to an average exposure level that is likely to occur at a site. We also use a "reasonable maximum exposure" (RME) scenario, which refers to exposure to the highest concentration of a chemical that is present at a site and is usually used as the basis for cleanup action at a Superfund site. The highest individual monitor well results for the VOCs would be the basis for RME risk calculations.

As shown in Table 2 the CTE scenario yielded unacceptable risks to human health.

Ecological Risk Characterization

The U.S. EPA presented a discussion of the potential risks to ecological receptors based upon PCB levels found in OMC Plant 2 site soil and sediment in the September 2007 ROD. However, we do not consider groundwater or DNAPL to present adverse ecological risks to receptors because the exposure pathways are now and are projected to remain incomplete. The DNAPL is 30 feet below ground surface and therefore is inaccessible to ecological receptors. Groundwater does not discharge on the ground surface at the site and thus is also inaccessible to ecological receptors. Groundwater contaminants do not appear to be discharging into Lake Michigan or Waukegan Harbor as yet, based on water samples taken from both shallow-screened and deep-screened monitoring wells located adjacent to the lake and harbor (see Figure 6). Contaminant discharges to the lake or harbor could occur in the future but they are projected to be negligible because site cleanup actions will greatly reduce the on-site contaminant levels and natural attenuation forces will further reduce levels as groundwater moves towards the lake and harbor.

Table 2: Risk values for the CTE scenario and pathways of concern

Chemical of Concern (concentration)	**Media**	**Actual or Potential Use**	**Exposure Pathway**	**ELCR**	**HI Quotient**
TCE (330 ppb)	Groundwater	Future Residential	Dermal contact, inhalation, and ingestion	**2.1×10^{-3}**	**31**
Cis-1,2-DCE (1200 ppb)	Groundwater	Future Residential	Dermal contact, inhalation, and ingestion	N/A	**3.5**
Vinyl chloride (160 ppb)	Groundwater	Future Residential	Dermal contact, inhalation, and ingestion	**3.6×10^{-3}**	**1.5**
Arsenic (330 ppb)	Groundwater	Future Residential	Dermal contact and ingestion	**9×10^{-3}**	**38**
TCE (71 ppb)	Indoor Air	Future Residential	Inhalation	5×10^{-5}	**2.0**
Vinyl chloride (147 ppb)	Indoor Air	Future Residential	Inhalation	**5.4×10^{-4}**	**1.4**

Note: A value in **bold red** indicates that the calculated risk is outside the target risk level or risk range.

As shown in Table 3, below, the RME scenario also yielded unacceptable risks to human health.

Table 3: Risk values for the RME scenario and pathways of concern

Chemical of Concern (concentration)	**Media**	**Actual or Potential Use**	**Exposure Pathway**	**ELCR**	**HI Quotient**
TCE (16,000 ppb)	Groundwater	Future Residential	Dermal contact, inhalation, and ingestion	**1×10^{-1}**	**1500**
Cis-1,2-DCE (250,000 ppb)	Groundwater	Future Residential	Dermal contact, inhalation, and ingestion	N/A	**730**
Vinyl chloride (16,000 ppb)	Groundwater	Future Residential	Dermal contact, inhalation, and ingestion	**3.6×10^{-1}**	**150**
Arsenic (1,430 ppb)	Groundwater	Future Residential	Dermal contact and ingestion	**4×10^{-2}**	**165**

Note: A value in **bold red** indicates that the calculated risk is outside the target risk level or risk range.

Basis for Taking Action

The U.S. EPA has determined that if left unaddressed, the chlorinated VOCs and arsenic in OMC Plant 2 site groundwater and the TCE DNAPL media present unacceptable risks to future human receptors based on our human health risk assessment results. Thus, the response actions selected in this ROD are necessary to protect public health or welfare from actual or threatened releases of hazardous substances, pollutants, or contaminants from the site that may present an imminent or substantial endangerment to public health or welfare.

H. Remedial Action Objective

The U.S. EPA's remedial action objective for the both the OMC Plant 2 site groundwater and DNAPL media is to reduce the concentrations of COCs in these media to levels that would allow the groundwater to be used for residential purposes without restrictions. This means that once we complete any cleanup actions, people who use the groundwater at the OMC Plant 2 site under the residential exposure assumptions could be exposed to residual VOC contaminant levels in the water or through indoor air intrusion but that would not cause their estimated ELCRs to exceed the estimated risk range of 1×10^{-4} to 1×10^{-6} or the calculated HI quotients to exceed 1. We would also meet applicable or relevant and appropriate requirements (ARARs) for environmental cleanup actions at the site.

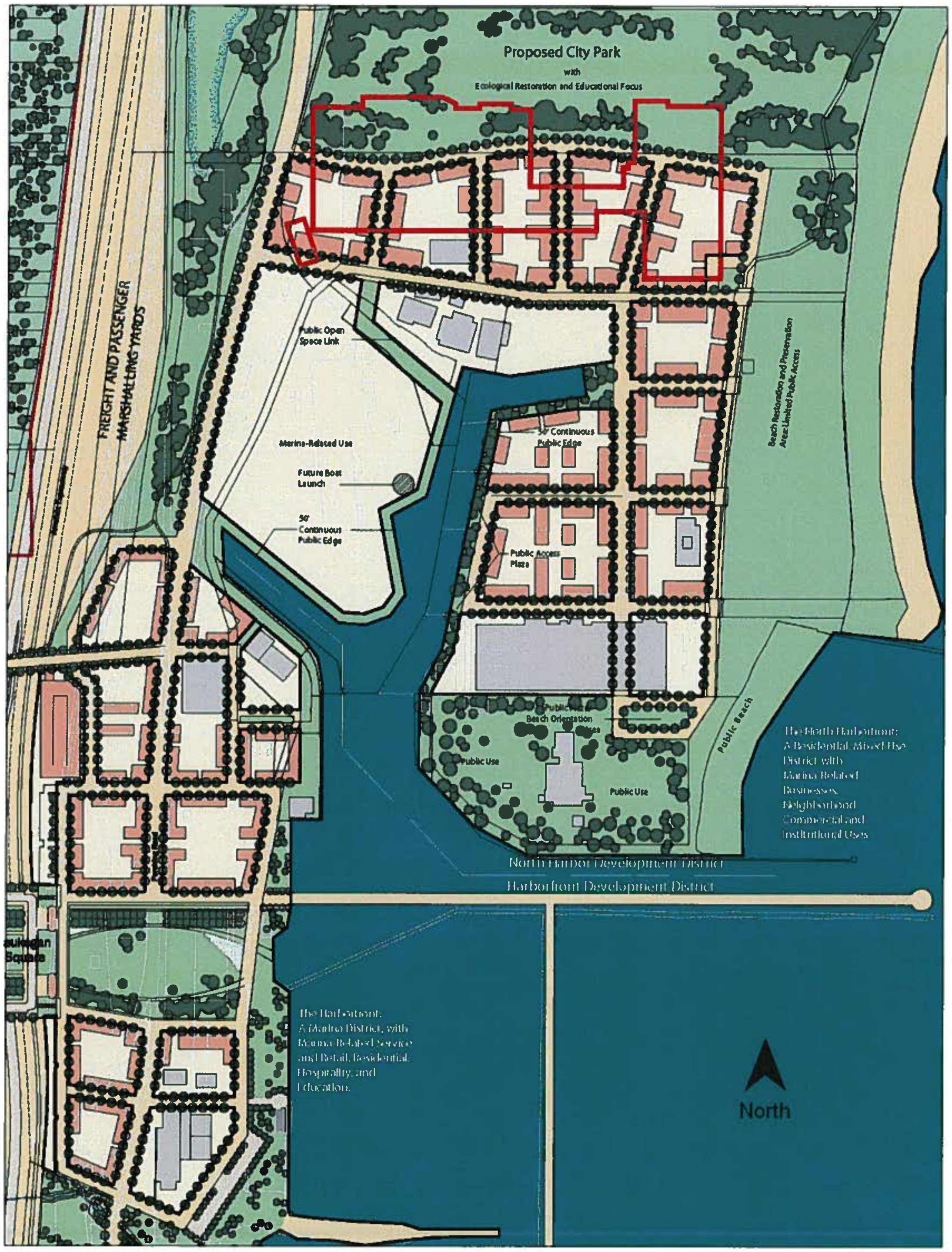
This remedial action objective is consistent with the reasonably anticipated future land use for the OMC Plant 2 site. The City of Waukegan has stated its desire to redevelop its lakefront into a high-density residential area over the next several years (Figure 9). The beachfront area would be retained for recreational use. Addressing the VOCs and arsenic in the groundwater and the TCE DNAPL media would remove the compounds from the environment or sever the exposure pathways so that human receptors would not be exposed to contaminant levels that create unacceptable risks.

To achieve the remedial action objective, U.S. EPA would need to reduce VOC and arsenic levels in the groundwater and the TCE DNAPL media to the target cleanup levels presented in Table 4, below.

Table 4: Site cleanup levels for VOCs and arsenic in groundwater

Compound	Media	Cleanup Level (Source)	Residual Risk
TCE	Groundwater	5 μg/L (MCL**)	ELCR = 3 x 10-6
cis-1,2-DCE	Groundwater	70 μg/L (MCL)	HI = 0.20
Vinyl chloride	Groundwater	2 μg/L (MCL)	ELCR = 4.7 x 10-5
Arsenic	Groundwater	10 μg/L (MCL)	ELCR = 2 x 10-4
TCE	DNAPL	(Maximum reduction practicable)	---------

Note: **Maximum Contaminant Level (MCL) under the Safe Drinking Water Act



Legend

OMC Plant 2 Building Outline

Feet
0 500 1000

Figure 9

Waukegan's Master Plan for Harborfront and North Harbor Development Districts

Source: Waukegan Lakefront-Downtown Master Plan/Urban Design Plan (Skidmore, Owings & Merrill LLP, June 23, 2003)

OMC Plant 2 and Vicinity

I. Description of Alternatives

The U.S. EPA evaluated site cleanup alternatives in the FS in order to reduce or eliminate the actual or potential risks to human health or the environment. We evaluated clean-up methods for each media (DNAPL, groundwater) at the OMC Plant 2 site by comparing them to the Nine Criteria (see Section J, below).

Presented below are brief descriptions of the remedial alternatives that we fully evaluated in the FS Report. A more thorough description of the selected remedies is presented in Section L, below.

DNAPL Alternatives

The U.S. EPA evaluated the following remedial action alternatives for the TCE DNAPL beneath the OMC Plant 2 site (each labeled "D" for "DNAPL"):

Alternative D1: No Action
Alternative D2: Institutional Controls and Monitoring
Alternative D3: Extraction, Collection, and Off-site Disposal
Alternative D4: Thermal Treatment
Alternative D5: Chemical Reduction

<u>Alternative D1</u>: **No Action**

It is U.S. EPA policy that requires that the No Action alternative be presented for comparison purposes only. Under this alternative, we would take no clean-up action to remove or contain the TCE DNAPL at the OMC Plant 2 site. This alternative is easily implemented; however, potentially harmful levels of TCE would remain on site causing potential indoor air intrusion hazards and providing a long term source of VOC contamination to site groundwater. We would recommend no future use of groundwater in the affected area because of the potential human health risks that the TCE may pose. The estimated total cost to implement Alternative D1 is $30,000, which consists of expenses related to performing future five-year reviews at the site.

<u>Alternative D2</u>: **Institutional Controls and Monitoring**

Under Alternative D2, U.S. EPA would also take no clean-up action to remove or contain the TCE DNAPL at the OMC Plant 2 site. This alternative is also easily implemented; however, potentially harmful levels of TCE would remain on site causing potential indoor air intrusion hazards and providing a long term source of VOC contamination to site groundwater. We would rely on using institutional controls (ICs) to prevent exposure of future site residents or workers to the TCE and monitor the site to evaluate whether exposures are occurring. Examples of ICs could include restrictions on well-drilling in the area to prevent the installation of water production wells into the

DNAPL. In addition, vapor barriers may need to be designed into dwelling foundations to prevent indoor air intrusion issues.

Although no construction activity is required under Alternative D2, it could take a year or more to negotiate the placement of ICs on the property with the City of Waukegan (the current property owner). The estimated total cost to implement Alternative D2 is $580,000, which includes expenses related to conducting air and groundwater monitoring and performing future five-year reviews at the site.

Neither the No Action or the ICs and Monitoring alternatives would satisfy the statutory preference for treatment of the DNAPL because it is a principal threat waste. The following alternatives, however, would satisfy the statutory preference for treatment.

<u>Alternative D3</u>: **Extraction, Collection, and Off-site Disposal**

Under Alternative D3, U.S. EPA would install two recovery wells in the DNAPL and periodically pump them to remove liquid TCE from the ground. We estimate that about 55 gallons of TCE could be recovered every month over an initial five year operating period. Recovered product would be disposed of (recycled or destroyed) in an off-site facility. After the five year operating period we would periodically monitor the wells to see if additional TCE could be recovered. Only about 10 percent of the TCE DNAPL is estimated to be recoverable under Alternative D3 and the remainder would be a long-term source of groundwater contamination beneath the site. Thus, we would need to also rely on using institutional controls (ICs) (see Alternative D2) to prevent exposure of future site residents or workers to the TCE and we would monitor the site to evaluate whether exposures are occurring.

After we completed the design stage and when funding was available, construction activity for Alternative D3 could be completed in about 12 months. We would implement this cleanup alternative after the building was demolished because the structure is located over a part of the DNAPL and may interfere with effective placement of the remedial components. The estimated total cost to implement Alternative D3 is $1.2 million.

<u>Alternative D4</u>: **Thermal Treatment**

Under Alternative D4, U.S. EPA would install thermal units in the ground down to the DNAPL and generate very high temperatures so that the TCE would vaporize. We would install soil vapor extraction wells to collect the TCE vapor for destruction in an on-site catalytic oxidizer or afterburner unit.

About 75 percent of the TCE DNAPL, or more than 90,000 kg (200,000 pounds), is estimated to be recoverable under Alternative D4. The remainder would be a long-term source of groundwater contamination beneath the site. Thus, we may need to also rely on using institutional controls (ICs) (see Alternative D2) to prevent exposure of future site residents or workers to the TCE and we would monitor the site to evaluate whether exposures are occurring.

After we completed the design stage and when funding was available, construction activity for Alternative D4 could be completed in about 12 months. We would implement this cleanup alternative after the building was demolished because the structure is located over a part of the DNAPL and may interfere with effective placement of the remedy. The estimated total cost to implement Alternative D4 is $9.8 million.

Alternative D5: **Chemical Reduction**

Under Alternative D5, U.S. EPA would use conventional soil-mixing equipment to inject a blend of zero-valent iron (ZVI) and bentonite clay into the DNAPL. The iron corrodes in the groundwater and releases hydrogen gas, which in turn reacts with the TCE and reductively dechlorinates it. The U.S. EPA conducted a bench-scale column test during the feasibility study using OMC Plant 2 site soil and samples of the TCE DNAPL to help determine the most effective and cost efficient mixture of ZVI and bentonite clay to inject. Data suggest that the majority of the TCE DNAPL will react with the ZVI within 90 days of injection.

As with Alternative D4, an estimated 75 percent of the TCE DNAPL will be readily destroyed under Alternative D5. The remainder would be a long-term source of groundwater contamination beneath the site. However, when the bentonite clay is mixed with the sand aquifer material, it will lower the hydraulic conductivity of the sand unit and create a barrier to groundwater flow. This will serve to isolate any unreacted TCE so that it does not become a long term source of dissolved groundwater contamination. We may need to rely on using institutional controls (ICs) (see Alternative D2) to prevent exposure of future site residents or workers to the TCE and we would monitor the site to evaluate whether exposures are occurring.

After we completed the design stage and when funding was available, construction activity for Alternative D5 could be completed in about 6-12 months. We would implement this cleanup alternative after the building was demolished because the structure is located over a part of the DNAPL and may interfere with effective placement of the remedy. The estimated total cost to implement Alternative D5 is $2 million.

Groundwater Alternatives

The U.S. EPA notes that because the TCE DNAPL is a principal threat waste it will likely be treated to reduce the toxicity, mobility, or volume of the TCE mass (see Section K). If the TCE DNAPL was not addressed, there would be little point in actively treating the groundwater contaminant plume because the DNAPL would be a constant source of TCE contamination. Thus, we evaluated the following alternatives for the VOC groundwater contaminant plume under the OMC Plant 2 site (each labeled "G" for "groundwater") with the understanding that the DNAPL would be treated using one of Alternatives D3, D4, or D5:

Alternative G1: No Action
Alternative G2: Monitored Natural Attenuation and Institutional Controls
Alternative G3: *In situ* Treatment of VOC Source Areas (Three methods)
Alternative G4: Groundwater Pump-and-Treat of VOC Source Areas (Two methods)
Alternative G5: Thermal Treatment of VOC Source Areas

We also evaluated the following alternatives that could serve as a barrier to off-site migration of VOCs in groundwater flowing south from site towards the harbor (see Figure 5) while we implemented one of the groundwater alternatives above:

Alternative G6: Permeable Reactive Barrier
Alternative G7: Air Sparge Curtain

We focused on treatment alternatives that only address the VOC "source areas" because site-wide applications would not be cost-effective. In addition, the treatment alternatives we evaluated do not directly address arsenic because the high levels seen in site wells are mostly associated with the adjacent Waukegan Coke Plant site. Arsenic and residual VOCs will therefore be addressed by all treatment options under a monitored natural attenuation approach and by placement of ICs on the site after active work is completed and before cleanup is deemed to be complete.

<u>Alternative G1</u>: **No Action**

It is U.S. EPA policy that requires that the No Action alternative be presented for comparison purposes only. Under this alternative, we would take no action to remove or contain the groundwater contaminant plume beneath the OMC Plant 2 site. This alternative is easily implemented and costs nothing. However, the potentially harmful levels of COCs would remain in site groundwater for as many as ten decades, especially if the TCE DNAPL is not addressed, and we would recommend no future use of the groundwater because of the potential human health risks that the COCs may pose. The estimated total cost to implement Alternative G1 is $30,000, which consists of expenses related to performing future five-year reviews at the site.

<u>Alternative G2</u>: **Monitored Natural Attenuation and ICs**

Under Alternative G2, U.S. EPA would take no physical action to remove or contain the groundwater contaminant plume beneath the OMC Plant 2 site. Instead, we would use a monitored natural attenuation (MNA) approach to track the cleanup of the contaminant plume. Natural attenuation is the reliance on natural forces such as dilution, degradation, and evaporation to reduce contaminant levels. Under the MNA approach, we would periodically monitor groundwater quality beneath the site and evaluate how well natural attenuation was working. As under the No Action alternative, the potentially harmful levels of COCs would remain in site groundwater for as many as ten decades, longer if the TCE DNAPL is not addressed, and we would recommend no future use of the groundwater because of the potential human health risks that the COCs may pose. Thus, groundwater monitoring would be conducted at the site for at least 100 years until cleanup levels are met.

Alternative G2 would rely on using institutional controls (ICs) to prevent exposure of future site residents or workers to the contaminant plume and monitor the site to evaluate whether exposures are occurring. Examples of ICs could include restrictions on well-drilling in the area to prevent the installation of water production wells into the groundwater. In addition, vapor barriers may need to be designed into dwelling foundations to prevent indoor air intrusion issues.

The estimated total cost to implement Alternative G2 is $1.1 million.

<u>Alternative G3</u>: ***In situ* Treatment of VOC Source Areas**

The U.S. EPA evaluated three different cleanup methods under Alternative G3 that comprise an active, *in situ* treatment approach for removal of VOCs in the source areas, although only <u>one</u> of the approaches would be implemented. The first method uses a chemical reductive dechlorination approach, the other two use reductive bioremediation methods. The remedial action goal is to reduce the dissolved levels of VOCs in the source areas to below 1 mg/L (1000 ppb) which then allows for the successful application of a site-wide MNA approach to achieve final cleanup levels.

During the feasibility study, U.S. EPA conducted an 18-month pilot-scale bioremediation study at the OMC Plant 2 site that consisted of the periodic injection of a sodium lactate (soluble substrate) and a soybean oil substrate (oil substrate) into two of the five designated "source areas" of the dissolved TCE groundwater plume. Analyses of groundwater samples taken from the test areas indicate that both the soluble substrate and oil substrate are successful at breaking down TCE, yielding vinyl chloride and cis-1,2-DCE as interim byproducts. However, results also indicate that the interim byproducts are being fully mineralized to yield non-hazardous ethene gas and chloride ion. Also, the bioremediation step is not hindered by the very high levels of dissolved TCE in the source areas.

Alternative G3a: **Chemical Reduction**

Alternative G3a consists of the injection of ZVI into the groundwater in the designated source areas thereby creating reducing conditions in the aquifer. The iron will react with groundwater and release hydrogen gas. In turn, the hydrogen reductively dechlorinates the TCE, *cis*-1,2-DCE, and vinyl chloride to non-hazardous ethylene gas. A single application of ZVI material would be needed to achieve the remedial action goal.

Alternative G3b: **Enhanced *In Situ* Bioremediation (Soluble Substrate)**

Alternative G3b consists of the injection of a soluble substrate (sodium lactate) into the groundwater source areas to enhance the ability of naturally occurring bacteria to anaerobically biodegrade (consume) the VOCs. A series of quarterly injections of the soluble substrate into the source areas would be performed over a 4-year period to achieve the remedial action goal.

Alternative G3c: **Enhanced *In Situ* Bioremediation (Soybean Oil Substrate)**

Alternative G3c consists of the injection of a soybean oil-based substrate into the groundwater source areas to enhance the ability of naturally occurring bacteria to anaerobically biodegrade (consume) the VOCs. An injection of the oil-based substrate into the source areas would be performed twice over a 4-year period to achieve the remedial action goal.

Each treatment method under Alternative G3 would target up to 96 percent of the estimated mass of dissolved VOCs in the groundwater for destruction. When active treatment is completed, U.S. EPA would begin a MNA approach for site groundwater for about two decades until final cleanup levels are met. Thus, groundwater monitoring would be conducted at the site for at about 20 years until cleanup levels are met. We would also apply ICs (see Alternative G2) to the property to help prevent exposure to residual contaminants.

After we completed the design stage and when funding was available, construction activity for Alternative G3a could be completed in about 12 months at an estimated present worth cost of $9.6 million. All construction activity for Alternative G3b could be completed in about 48 months at an estimated present worth cost of $8.3 million. For Alternative G3c, all construction activity could also be completed in about 48 months at an estimated present worth cost of $11.2 million.

Alternative G4: **Pump-and-Treat of VOC Source Areas**

The U.S. EPA evaluated two different conventional groundwater pump-and-treat approaches for the VOC source areas under Alternative G4, although only one of the approaches would be implemented. The first alternative is a 10-year active pump-and-treat action that targets the removal of up to 96 percent of the VOC mass in site groundwater. The second is a 20-year pump-and-treat action that targets the removal of up to 99 percent of the VOC mass in the aquifer.

Alternative G4a: **10-year Pump-and-Treat**

Pumping wells would be installed in the five "source areas" and operated for 10 years to reduce dissolved VOC levels in the groundwater. Extracted water would be treated by air stripping with a granular activated carbon (GAC) polishing step and the treated water would be discharged to the North Ditch. The VOCs removed by the air stripper would be thermally treated to destroy them before discharge to the atmosphere. Spent GAC units would be taken off site for re-use or disposal.

This method would target up to 96 percent of the estimated mass of dissolved VOCs in the groundwater for removal and destruction. When treatment is completed, U.S. EPA would take a MNA approach and apply ICs (see Alternative G2) for site groundwater for about two decades until final cleanup levels are met. Thus, we would conduct groundwater monitoring at the site, after we ceased the pump-and-treat step, for another 20 years until cleanup levels are met.

Alternative G4b: **20-year Pump-and-Treat**

Pumping wells would be installed in the source areas and operated for 20 years to reduce dissolved VOC levels in the groundwater. Extracted water would be treated by air stripping with a granular activated carbon (GAC) polishing step and the treated water would be discharged to the North Ditch. The VOCs removed by the air stripper would be thermally treated to destroy them before discharge to the atmosphere. Spent GAC units would be taken off site for re-use or disposal.

This method would target up to 99 percent of the estimated mass of dissolved VOCs in the groundwater for removal and destruction. When treatment is completed, U.S. EPA would take a MNA approach and apply ICs (see Alternative G2) for site groundwater for about a decade until final cleanup levels are met. Thus, we would conduct groundwater monitoring at the site, after we ceased the pump-and-treat step, for another 10 years until cleanup levels are met.

After we completed the design stage and when funding was available, all construction activity for Alternatives G4a and G4b could be completed in about 12 months and then operation and maintenance of the extraction systems would run for the designated 10- or 20-year term. The estimated present worth cost to implement Alternative G4a is $8 million and the estimated present worth cost to implement Alternative G4b is $10.6 million.

Alternative G5: **Thermal Treatment of VOC Source Areas**

Under Alternative G5, U.S. EPA would use thermal units to heat up the groundwater to volatilize the water and VOCs to a gas that is then captured using soil vapor extraction (SVE) equipment. The VOC gas stream would be thermally oxidized before it is exhausted to the atmosphere. Collected water vapor would be cooled to yield liquid water and then treated by air stripping with a granular activated carbon (GAC) polishing step. The treated water would be discharged to the North Ditch. The VOCs removed by the air stripper would be thermally treated to destroy them before discharge to the atmosphere. Spent GAC units would be taken off site for re-use or disposal. The system would be run for about 24 months before about 96 percent of the VOC mass is removed. Upon completion of active cleanup work we would apply ICs (see Alternative G2) and transition to the use of a MNA approach to track the final reduction of the groundwater plume for about two decades until final cleanup levels are met. Thus, we would conduct groundwater monitoring at the site, after we ceased the treatment step, for another 20 years until cleanup levels are met. The estimated present worth cost to implement this alternative is $37,900,000, including estimated periodic monitoring costs and expenses related to performance of five-year reviews at the site.

The following alternatives were evaluated for potential use in concert with the groundwater alternatives discussed above because they do not actively capture the contaminant plume before cleanup levels are reached. The following alternatives provide a barrier to the movement of VOCs off site as groundwater flows towards the harbor:

<u>Alternative G6</u>: **Permeable Reactive Barrier**

Under Alternative G6, U.S. EPA would install a Permeable Reactive Barrier (PRB) on the southern boundary of the site to treat the chlorinated VOCs in the groundwater as it moves off site towards the harbor. The PRB would be a trench about 800 feet long, 30 feet deep, and 1-2 feet thick and be filled with ZVI reactive media. The ZVI media would react with water to produce hydrogen gas, which then reductively dechlorinates the chlorinated VOCs in the groundwater as it flows through the PRB. As a result, the chlorinated VOCs concentrations will be reduced to below cleanup levels before the groundwater flowed off site. The estimated present worth cost to implement this alternative is $6,220,000, including estimated periodic monitoring costs and expenses related to performance of five-year reviews at the site.

<u>Alternative G7</u>: **Air Sparge Curtain**

Under Alternative G7, U.S. EPA would install an Air Sparge Curtain (ASC) system along the southern boundary of the site to treat VOCs in the groundwater as it moves off site towards the harbor. The ASC would consist of a 1000-foot slotted pipe horizontally drilled into the aquifer. Air would be pumped through the slots to help cause VOCs to volatilize out of the groundwater before it flowed off site. It would not be necessary to try to recover the VOCs for treatment because the estimated daily discharge levels do not exceed daily or yearly discharge limits under Illinois Administrative Code (IAC) Title 35, Environmental Protection, Subtitle B: Air Pollution. We also assumed that any new buildings placed on the property would be subject to ICs in the form of requirements for foundations to be designed to prevent indoor air inhalation risks from site VOCs. The ASC system would be operated for about 30 years. The estimated present worth cost to implement this alternative is $2,430,000, including estimated periodic monitoring costs and expenses related to performance of five-year reviews at the site.

J. Summary of Comparative Analysis of Alternatives

The U.S. EPA evaluated the proposed alternatives using the Nine Criteria:

Overall protection of human health and the environment - addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

All of the alternatives, except for the no-action alternatives, are protective of human health and the environment because they would eliminate, reduce, or control actual or potential health risks through a combination of the use of engineering controls and institutional controls.

Compliance with ARARs (Applicable or Relevant and Appropriate Requirements) - addresses whether a remedy will meet all applicable or relevant and appropriate requirements of federal and state environmental laws or provides a basis for invoking a waiver of any of the requirements.

All of the alternatives, except for the no-action alternatives, would attain federal and state ARARs specific to each approach. The main ARAR for the groundwater media is the Safe Drinking Water Act (SDWA). The U.S. EPA used Maximum Contaminant Levels (MCLs) promulgated under the SDWA to set groundwater cleanup levels for the site. The SDWA was enacted to protect human health by limiting contaminants in drinking water supplied to municipal consumers; however, because the contaminated aquifer is not an actual source of drinking water, the SDWA is not an applicable requirement at the OMC Plant 2 site. The aquifer, however, could be a potential source of drinking water if it were not impacted by site contaminants. In addition, the SDWA provides that protective contaminant levels to be delivered to consumers. Thus, the SDWA is sufficiently similar ("relevant") and well-suited ("appropriate") to be applied at the site in terms of using MCLs to set cleanup levels.

Illinois enacted IAC Title 35, Part 302 and Part 620 (Illinois Water Quality Standards) to protect the quality of the State's usable groundwater aquifers. These regulations could be considered as applicable to the groundwater aquifer at the site because it would potentially be usable if it were not contaminated with VOCs (see Table 7 – beginning on page 52).

Long-term effectiveness and permanence - refers to the ability of a remedy to maintain reliable protection of human health and the environment over time after clean-up goals have been met.

Alternatives D1 (No Action) and D2 (ICs and Monitoring) do not provide long-term protection because they would not actively reduce the TCE mass. The three active treatment DNAPL remedies do provide for long term protectiveness because they permanently reduce the toxicity, mobility, or volume of the TCE mass. Alternatives D4 (Thermal Treatment) and D5 (Chemical Reduction) are more robust and address at least 75 percent of the TCE whereas Alternative D3 (Extraction, Collection, and Disposal) only addresses 10 percent. The more TCE mass that is addressed the less it behaves as a long-term source of groundwater contamination.

Of the groundwater alternatives, the active treatment methods (G3-G7) permanently reduce an estimated 96-99 percent of the dissolved VOC mass in the plume. This would create more ideal site conditions to later apply a MNA approach and ICs to achieve protection of human health. Alternative G1 (No Action) does not provide any degree of long-term effectiveness.

Reduction of toxicity, mobility, or volume - refers to the anticipated performance of the treatment technologies that a remedy may employ with respect to principal threat wastes at a site.

The U.S EPA considers the TCE DNAPL to constitute a principal threat waste see Section K) at the OMC Plant 2 site. Alternatives D1 (No Action) and D2 (ICs and Monitoring) do not treat the TCE DNAPL; however, the rest of the DNAPL alternatives do use treatment methods to permanently reduce the toxicity, mobility, or volume of the waste. We estimate that Alternative D3 (Extraction, Collection, and Disposal) will permanently destroy about 10 percent of the TCE DNAPL mass whereas Alternatives D4 (Thermal Treatment) and D5 (Chemical Reduction) would each permanently destroy at least 75 percent of the TCE mass. The use of bentonite clay under Alternative D5 would also help reduce the mobility of the remaining TCE in the DNAPL area by creating an area of low hydraulic conductivity within the sand aquifer and thus preventing the flow of groundwater through the remaining mass.

The use of treatment to reduce toxicity, mobility, or volume of contamination at the site does not apply to groundwater alternatives because we do not consider the groundwater contaminant plume to be a principal threat waste (see Section K).

Short-term effectiveness - involves the period of time needed to achieve protection and any adverse impacts on human health and environment that may be posed during construction and implementation of a clean-up action.

All of the active treatment alternatives involve some degree of short-term exposure by workers to construction hazards during cleanup. Temporary engineering controls such as air monitoring, protective clothing, and following health and safety protocols would be used to reduce potential exposures or risks. Each action alternative achieves protectiveness in generally the same amount of time – about 12 months.

The no-action alternatives would not have short-term effects.

Implementability – refers to the technical and administrative feasibility of a remedy, including availability of goods and services needed to carry out the chosen option.

All alternatives are easily implemented. Goods and services are readily available to implement the action alternatives.

Cost - includes estimated capital and operation and maintenance costs and estimated present-worth costs.

The no-action alternatives cost nothing to implement. The estimated present worth costs for the DNAPL action alternatives range from $1.2 million to $9.8 million. The estimated present worth costs for the groundwater treatment alternatives range from $2.4 million to $37.5 million.

State agency acceptance - indicates whether, based on comments submitted after its review of the Proposed Plan, a support agency concurs, opposes, or has no comment on the preferred alternative.

Illinois EPA has indicated that it supports Alternative D5, Chemical Reduction, Alternative G3b, In Situ Treatment of VOCs, and Alternative G7, Air Sparge Curtain.

Community acceptance - refers to the assessment of public comments received on the Proposed Plan.

The community generally expressed support for taking action to address the site contaminants.

Tables 5a and 5b (next pages) summarize the evaluation of clean-up alternatives for the OMC Plant 2 site.

Proposed Plan

The U.S. EPA's proposed plan for the soil and sediment and building media at the OMC Plant 2 site was to implement Alternative D5 (Chemical Reduction) to treat the TCE DNAPL and Alternatives G3b (Enhanced Bioremediation, Soluble Substrate) and G7 (Air Sparge Curtain) to address VOCs in the groundwater contaminant plume.

Table 5a: Evaluation of DNAPL remedial alternatives using the Nine Criteria

Criterion	No Action Alternative	Institutional Controls	Extraction and Treatment	Thermal Treatment	Chemical Reductive Treatment
Protection of human health and the environment	Not Protective	Is Protective	Is Protective	Is Protective	Is Protective
Meets ARARs	No	Yes	Yes	Yes	Yes
Long term effectiveness	Not effective	Not effective	Is somewhat effective	Is effective	Is effective
Reduction of toxicity, mobility, or volume	None	None	About 10% of DNAPL is destroyed	About 75% of DNAPL is destroyed	About 75% of DNAPL is destroyed
Short-term effectiveness	No construction needed	No construction needed	12 months to complete	12 months to complete	4 months to complete
Implementability	Easily implemented	Easily implemented	Easily implemented	Easily implemented	Easily implemented
Cost	None	$0.6 million	$1.2 million	$9.8 million	$2.0 million
State acceptance	No	No	Yes	Yes	Yes – preferred approach
Public acceptance	No	No	Yes	Yes – a preferred approach	Yes – a preferred approach

Table 5b: Evaluation of groundwater remedial alternatives using the Nine Criteria

Criterion	**No Action Alternative**	**MNA and Institutional Controls**	***In Situ* Reductive Treatment**	**Pump-and-Treat**	**Thermal Treatment**	**Permeable Reactive Barrier**	**Air Sparge Curtain**
Protection of human health and the environment	Not Protective	Is Protective	Is Protective	Is Protective	Is Protective	Is Protective	Is Protective
Meets ARARs	No	Yes	Yes	Yes	Yes	Yes	Yes
Long term effectiveness	Not effective	Not effective	Is effective	Is effective	Is effective	Is effective	Is effective
Reduction of toxicity, mobility, or volume	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Short-term effectiveness	No construction	No construction	1-4 years to complete	10-20 years to complete	1-2 years to complete	12 months to install	12 months to install
Implementability	Easily implemented	Easily implemented	Easily implemented	Easily implemented	Easily implemented	Easily implemented	Easily implemented
Cost	None	$1.1 million	$8-11 million	$8-10 million	$37.5 million	$6.2 million	$2.4 million
State acceptance	No	No	Yes – preferred approach	Yes	No	Yes	Yes - preferred approach
Public acceptance	No	No	Yes – preferred approach	Yes	No	Yes	Yes - preferred approach

K. Principal Threat Wastes

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes an expectation that U.S. EPA will use treatment technology to address the principal threat wastes at a site wherever practicable (NCP § 300.430(a)(1)(iii)(A)). Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Remedies that involve treatment of principal threat wastes likely will satisfy the statutory preference for treatment as a principal element.

The U.S. EPA considers the TCE DNAPL to be a principal threat waste because it is highly toxic and cannot be reliably contained. The statutory preference for treatment as a principal element thus would apply to the TCE DNAPL. We consider the groundwater contaminant plume to constitute a low level, long-term threat to human health or the environment; therefore, it is not a principal threat waste and the statutory preference for treatment does not apply.

L. Selected Remedy

The U.S. EPA selects **Alternative D5 – Chemical Reduction** to clean up the DNAPL media and **Alternatives G3b and G7 – Enhanced Bioremediation (Soluble Substrate) and Air Sparge Curtain** to clean up the groundwater media at the OMC Plant 2 site.

Rationale for Selection

The U.S. EPA did not select the No Action alternatives for both the DNAPL and groundwater media because they are not protective of human health and the environment and would not meet ARARs.

We selected an active treatment remedy for the DNAPL media because it is a principal threat waste and U.S. EPA has a statutory preference to utilize permanent treatment remedies to address principal threat wastes. In addition, if the DNAPL mass was not addressed, the active treatment approaches for groundwater cleanup would be ineffective because the DNAPL would remain as a long-term source of TCE contamination to the groundwater.

We evaluated three alternatives to actively treat the DNAPL. However, Alternative D3 (Extraction, Collection, and Disposal) only addresses an estimated 10 percent of the TCE mass, whereas Alternative D4 (Thermal Treatment) and Alternative D5 (Chemical Reduction) both should achieve a minimum of 75 percent reduction of the TCE mass. Between the two, Alternative D5 is much less costly than Alternative D4 to implement. Alternative D5 also provides for containment of residual or untreated TCE in the DNAPL area by using bentonite clay to create an impermeable zone within the groundwater aquifer. Groundwater will flow around the treated DNAPL zone instead of through it, thereby reducing the availability of any remaining TCE to dissolve into the groundwater. Therefore, Alternative D5 is protective and the most effective and cost-effective approach to address the TCE DNAPL at the OMC Plant 2 site.

We selected an active treatment remedy for the groundwater media although it is not a principal threat waste and thus the preference for treatment would not apply. The water table aquifer beneath the OMC Plant 2 site is a potentially usable aquifer for potable purposes; therefore, U.S. EPA's policy that groundwater quality should be restored to protective levels for beneficial uses would apply. Use of Alternatives G1 (No Action) or G2 (MNA and ICs), absent active treatment methods, would cause the aquifer to be unusable for as many as ten decades, so these approaches were rejected. In contrast, groundwater Alternatives G3 (*In situ* Reductive Treatment), G4 (Pump-and-Treat), and G5 (Thermal Treatment) actively reduce VOC levels in the groundwater source areas so that a MNA approach could later be successfully be applied over a one to two decade time period, a significant reduction in time that the aquifer would be unusable.

Of the active treatment alternatives, Alternative G5 is the most expensive approach at $37.5 million. The other alternatives are more comparable in terms of cost. Alternative G3b (Bioremediation with Soluble Substrate) and Alternative G4a (10-year Pump-and-Treat), however, are the least expensive approaches, both costing about $8 million to implement and both achieving an estimated reduction of 96 percent of the VOCs dissolved in the groundwater source area zones. Between the two remedies, Alternative G3b provides for use of an innovative, *in situ* cleanup approach that needs a more limited operation and maintenance effort than Alternative G4a, a standard pump-and-treat remedy. Thus, Alternative G3b presents a protective, cost-effective, and more short-term effective treatment approach to address the groundwater contaminant plume at the OMC Plant 2 site.

We also selected Alternative G7 (Air Sparge Curtain) to help us manage a part of the plume while the groundwater treatment remedy is underway. Groundwater flows towards the harbor from the south side of the site and the use of an air sparge curtain to remove VOCs from the water as it flows off-site will ensure that indoor air intrusion problems would not crop up on the Larsen Marine Service property across the street. Alternative G6 (Permeable Reactive Barrier) would be equally effective in removing VOCs from the groundwater, but is costs nearly three times as much to construct and maintain as Alternative G7.

<u>Description of the Selected Remedies</u>

1. **Alternative D5**

The U.S. EPA will mobilize a soil-mixing unit to the site to inject a blend of reagents consisting of Zero Valent Iron (ZVI) material and bentonite clay into the TCE DNAPL zone beneath the site (see Figure 7, above). The U.S. EPA determined the proper blend of reagents in 2007 in a bench-scale column study using site soil and TCE to test different manufacturers' products and blends. The soil-mixing unit uses a minimum 6-foot diameter auger that will be advanced to a target depth of 30 feet. Upon reaching the target depth, the ZVI/bentonite blend will be injected through the auger into the DNAPL zone. The auger would be raised and lower several times in the soil column to ensure more complete mixing of the DNAPL and reagent. Soil mixing would be conducted on 4-5 foot centers to ensure overlap so that as much DNAPL zone is treated as possible. We estimate that the soil mixing process would take about 2-3 months to complete. In addition, based on the results of the soil column testing studies, the destruction of the TCE mass by the ZVI material should be substantially completed within about 90 days of injection.

The soil-mixing work above the DNAPL zone will leave a loose, "fluffed up" area of surface soil that will not support buildings unless action is taken to amend the soil. Typically, after a several-year monitoring period, one may mix cement into the top several feet of mixed soil to create a firmer footing to build on. The addition of cement is not recommended to occur at the same time as the reagent blend is added because the laboratory testing has shown that the reduction reaction fails to occur if cement is present.

The U.S. EPA will install eight nested monitoring wells (four shallow, four deep) down gradient of the mixing zone to determine whether TCE was released into the groundwater by the mixing action and to track changes over time, if any, of the TCE concentrations in the groundwater plume. Groundwater samples will be analyzed for VOCs and MNA indicator parameters.

We may apply institutional controls (ICs) on the property, depending on its actual future use, to prevent exposure of future site residents or factory workers to any residual TCE DNAPL. Examples of ICs could include the recording of restrictive covenants on the property deed and/or the enactment of a municipal ordinance to prevent the installation of water production wells into the DNAPL. In addition, restrictive covenants could require that vapor barriers be designed and installed into building or dwelling foundations to prevent indoor air intrusion issues.

2. **Alternative G3b**

The U.S. EPA will install an array of injection wells screened in the groundwater "source areas" shown on Figure 7. Every three months a solution of sodium lactate (or its equivalent) and water will be mixed and then injected into each well. Injection of the lactate material will occur over a 4-year period, yielding 16 total injection events. The injection wells would be maintained and monitored for a 10-year period to determine whether the desired reactions have occurred and whether additional injections are needed on a spot basis after the 4-year injection period is completed.

The U.S. EPA conducted an 18-month pilot-scale study at the OMC site using both sodium lactate ("soluble substrate") and edible oil substrate (EOS) ("oil substrate") in two more highly-contaminated areas of the dissolved TCE groundwater plume. Test results indicate that both the soluble substrate and oil substrate are successful at stimulating indigenous anaerobic bacteria to break down TCE despite the very high levels of dissolved TCE present in the source areas. Vinyl chloride and *cis*-1,2-DCE are interim breakdown products of the TCE; however, these get mineralized to ethene and chloride ion. Test results also show that the bioremediation step is needed for four years and to only address the very high dissolved TCE source areas. Based on groundwater monitoring results, an MNA approach will be successful at the site and only take about 10-20 years to reach final cleanup standards. The FS and the pilot-scale study reports discuss the bioremediation results in more detail.

The U.S. EPA will require that institutional controls (ICs) be placed on the site to assist in the maintenance of remedy protectiveness as well as preventing the use of groundwater for potable purposes until cleanup levels are met. Examples of ICs include restrictive covenants and/or municipal ordinances that prohibit the use of the groundwater for drinking until the cleanup standards are met. The restrictive covenants would also prohibit the redevelopment of parts of the site until the injection wells for bioremediation and the water quality monitoring wells are no longer needed.

After the series of sodium lactate injections are completed, U.S EPA will conduct a MNA program to track the final cleanup of the contaminant plume. Groundwater samples will be taken from existing monitoring wells to be analyzed for VOCs, arsenic, and MNA indicator parameters. We estimate that it will take about a decade or two to reach cleanup levels after completion of both the lactate injections and the TCE DNAPL cleanup action.

3. **Alternative G7**

The U.S. EPA will install an air sparge curtain (see Figure 7) along the south side of the site to remove VOCs from the groundwater as it flows towards the harbor. The air sparge curtain consists of a 1000-foot slotted pipe that is horizontally installed in the aquifer at a depth of about 25-30 feet below ground surface at about the base of the sand aquifer. The pipe is attached to a blower system that will force air into the pipe so that it bubbles out the slotted areas. The bubbled air will rise up the water column and strip VOCs from solution as it rises. The blower will be operated for about 20-30 years until the groundwater cleanup levels are met. The air bubbles and stripped VOCs will discharge into the vadose zone (area in the soil above the groundwater table) and then dissipate into the atmosphere. It would not be necessary to try to recover the VOCs for treatment because the estimated daily discharge levels do not exceed daily or yearly discharge levels under Illinois Administrative Code (IAC) Title 35, Environmental

Protection, Subtitle B: Air Pollution. We also assume that any new buildings placed on the property would be subject to ICs in the form of requirements for foundations to be designed to prevent indoor air inhalation risks from site VOCs. Therefore, the potential indoor air intrusion exposure pathway is reduced or eliminated.

Cost Estimates for the Selected Remedies

Major cost elements of the selected remedies are shown in Table 6.

Table 6: Major cost elements of the Selected Alternatives

Capital Cost Items	**Alternative D5 Chemical Reduction**	**Alternative G3b Bioremediation**	**Alternative G7 Air Sparge Curtain**
Mobilization	$ 250,000	$ 15,000	(Included in installation)
Reagents	$ 135,000	$ 525,000	Not applicable
Installation	$ 360,000	$ 3,400,000	$ 369,000
Other (fence, etc.)	$ 54,000	$ 250,000	$ 11,000
ICs	$ 15,000	$ 15,000	Not applicable
Oversight Labor	$ 40,000	$ 1,520,000	$ 5,000
Confirmation Sampling	$ 25,000	$ 70,000	$ 18,000
Well Installation	$ 65,000	$ 33,000	$ 28,000
Subtotals	**$ 944,000**	**$ 5,828,000**	**$ 437,000**
Payment Bond, Insurance; Contractor G&A; Fee (5%)	$ 218,000	$ 470,000	$ 95,000
25% Contingency and Program Management	$ 326,000	$ 700,000	$ 144,000
Project Management, Design, and On-Site Construction Management	$ 245,000	$ 390,000	$ 135,000
Operation, Maintenance, and Monitoring Costs - Present Worth at 7%	$ 230,000 (Years 1 to 10)	$ 820,000 (Years 1 to 30)	$ 1,640,000 (Years 1 to 30)
Five-Year Reviews	$ 30,000	$ 90,000	(Included with Alt. G3b)
Totals	**$2 million**	**$ 8.3 million**	**$ 2.4 million**

Notes: Estimates from FS Report. Volume estimates may be refined during the remedial design, potentially impacting cost estimates. Accuracy is within +50% or – 30%.

Expected Outcomes of the Selected Remedies

Once U.S. EPA completes the soil-mixing step under Alternative D5, there will likely be residual TCE mass in the DNAPL area in the aquifer; however, it will be isolated by the bentonite clay and will no longer be a major source of TCE groundwater contamination. The ground surface over the treated TCE DNAPL area will be "fluffed up" by the soil mixing equipment and may take a few years to re-compact. Unless the top 5 feet or so of the soil in this area are amended with cement it should not be built upon.

After U.S. EPA completes the four years of soluble substrate injections under Alternative G3b, the groundwater VOC levels in the source areas will be reduced to below 1000 ppb. At that point we will enter into a MNA approach and track the reduction in VOC (and arsenic) levels in the plume over time. Cleanup levels should be reached within a decade or two of the initial injection of the soluble substrate. When cleanup levels (MCLs) are reached, a nominal 5 $x10^{-5}$ ELCR risk (excluding arsenic) to future residential groundwater users of the property would remain.

Once U.S. EPA completes the installation of the air sparge curtain under Alternative G7, we will operate the air blower for up to 30 years while the above groundwater remedial approaches are underway. VOC levels in groundwater flowing off-site to the south towards the harbor should be reduced to below cleanup levels and therefore would not present an indoor air intrusion issue on the Larsen Marine Service property.

When all remedial actions are completed or installed at the OMC Plant 2 site, the surface of the site would be immediately ready for reuse without restrictions except for the containment cell areas, the air sparge curtain area, and the injection well/monitoring well installation areas. These areas would need to have restrictive covenants placed on the property deed that prohibit the redevelopment of the areas unless the remedial components are no longer needed. Groundwater use should be prohibited until at least when cleanup levels are met in about two decades.

M. Statutory Determinations

Section 121 of CERCLA (42 U.S.C. § 9621) and the NCP state that the lead agency must select remedies for Superfund sites that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how Alternatives D5, G3b, and G7 meet these statutory requirements.

1. Protection of Human Health and the Environment

Alternatives D5, G3b, and G7 will protect human health and the environment by removing or reducing the COCs in the groundwater at the site to meet recommended cleanup levels. This will reduce to an acceptable level the potential risks due to groundwater ingestion and/or indoor air intrusion (inhalation). We estimate that the potential ELCR associated with these exposure pathways is as high as 1.5×10^{-2}. The selected remedies will reduce the potential ECLR for exposure to groundwater contaminants to within the target risk range of 1×10^{-4} to 1×10^{-6}.

The selected alternatives have no short-term threats to human health or the environment that cannot be readily controlled while the cleanup approaches are implemented.

2. Compliance with Applicable or Relevant and Appropriate Requirements, Including Other Criteria, Advisories, or Guidance To Be Considered (TBCs)

Alternatives D5, G3b, and G7 will comply with all ARARs and identified TBCs. Table 7 (following the next page) presents federal and State of Illinois ARARs and TBCs.

3. Cost-Effectiveness

The U.S. EPA has determined that Alternatives D5, G3b, and G7 are cost-effective and represent a reasonable value for the estimated expenditure. We made this determination using the following definition of cost-effectiveness from the NCP: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (40 CFR § 300.430(f)(1)(ii)(D)). Since the treatment alternatives for each media satisfy the threshold criteria (i.e., are protective of human health and the environment and comply with ARARs) and nearly equally satisfy four of the five balancing criteria (short-term effectiveness, long-term effectiveness and permanence, implementability, and reduction in toxicity, mobility, and volume through treatment), U.S. EPA evaluated overall effectiveness by assessing the present worth cost of each alternative.

Alternatives D4 (Thermal Treatment) and D5 (Chemical Reduction) both address at least 75 percent of the TCE mass in the DNAPL; however, Alternative D4 would cost $9.8 million to implement while Alternative D5 would cost much less at $2 million. Although Alternative D3 (Extraction, Collection, and Disposal) at $1.2 million would cost less than Alternative D5, it only would address about 10 percent of the TCE mass in the DNAPL. Thus, for a relatively small increase in cost in contrast to Alternative D3, a much greater amount of TCE would be destroyed under Alternative D5. Hence, Alternative D5 is the cost-effective treatment remedy for the TCE DNAPL media.

Alternatives G3 (*In situ* Reduction), G4 (Pump-and-Treat), and G5 (Thermal Treatment) would each address 96-99 percent of the dissolved VOC mass in the groundwater contaminant plume. However, Alternative G5 is very costly at an estimated $37.5 million. The estimated costs for Alternatives G3 and G4 range from $8 million to $11 million, which are considerably lower than Alternative G5. Of these approaches, Alternatives G3b (*In Situ* Enhanced Bioremediation, Soluble Substrate) and G4a (10-year Pump-and-Treat) are the least expensive at about $8 million each. Alternative 4a would require a greater operation and maintenance effort, thereby making Alternative G3b the cost-effective treatment remedy for the groundwater contaminant plume.

Alternatives G6 (Permeable Reactive Barrier) and G7 (Air Sparge Curtain) both provide for removal of VOCs from the groundwater as it flows south off site towards Waukegan Harbor. However, Alternative G6, at $6.2 million, is much more expensive than Alternative G7 at $2.4 million, although the operation and maintenance requirements would be a little greater under Alternative G7. Thus, Alternative G7 is the cost-effective treatment remedy for the groundwater moving off site towards the harbor.

4. Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

Alternative D5 (Chemical Reduction) uses permanent solutions and alternative treatment technologies to the maximum extent practicable with respect to the TCE DNAPL media. The injection of the ZVI material will cause a minimum of 75 percent of the TCE mass to be permanently destroyed at a cost comparable to that of Alternative D3, an extraction and treatment approach that would only address 10 percent of the TCE mass. Alternative D4 is a more robust remedy using thermal treatment, but it would cost four times as much but still only address the same 75 percent of the TCE mass as Alternative D5.

With respect to the groundwater media, Alternative G3b uses an innovative enhanced bioremediation approach to clean up VOCs *in situ* at a cost comparable to conventional pump-and-treat technology.

5. Preference for Treatment as a Principal Element

(See also Section K, above.) The U.S. EPA has identified the TCE DNAPL as a principal threat waste at the site. Thus, the statutory preference for treatment as a principal element applies to the TCE DNAPL media. Alternative D5 (Chemical Reduction) satisfies this preference by treating the DNAPL with ZVI to destroy a minimum of 75 percent of the TCE mass and using bentonite clay to create a low-permeability zone in the sand aquifer to isolate unreacted TCE from the groundwater.

The groundwater contaminant plume is not a principal threat waste and the preference for treatment as a principal element does not apply.

Five-Year Review Requirement

The U.S. EPA has completed three Five-Year Review Reports for the OMC site (1997, 2002, 2007) due to residual contaminants being left on-site (in the PCB containment cells) above levels that do not allow for unrestricted use and unrestricted exposure after OMC performed the initial harbor cleanup actions. After U.S. EPA completes Alternatives D5, G3b, and G7, there still will be residual contaminants remaining on-site (in the containment cells) above levels that do not allow for unrestricted use and unrestricted exposure. Thus, we will continue to conduct a statutory Five-Year Review at the OMC site every five years to ensure that the remedies selected in this ROD are, or will be, protective of human health and the environment.

N. Documentation of Significant Changes

The U.S. EPA released the Proposed Plan for the OMC Plant 2 site for public comment on August 2, 2008. The Proposed Plan identified Alternatives D5, G3, and G7 as the preferred alternatives for the DNAPL and groundwater. We reviewed all written and verbal comments submitted during the public comment period and determined that no significant changes to the remedy, as originally presented in the Proposed Plan, were desirable or appropriate.

Table 7: List of ARARs for OMC Plant 2 – Groundwater and DNAPL

Regulation	Requirement	ARAR Status	Analysis
Chemical-Specific ARARs			
CERCLA Guidance on Land Use in the CERCLA Remedy Selection Process	Establishes appropriate considerations in defining future land use.	TBC	Provides guidance to EPA in selecting land use for remedy selection purposes.
Illinois Administrative Code (IAC) Title 35, Part 742, Tiered Approach to Corrective Action Objectives (TACO)	TACO establishes a framework for determining soil and groundwater remediation objectives standards and for establishing institutional controls. Tier 1 remediation objectives are set at 10^{-6} ELCR and HI =1 values. Section 742.900(d) Tier 3 remediation objectives allow cleanup levels within the ELCR range of 10^{-4} to 10^{-6}.	TBC	TACO is a voluntary program and is not required (Part 742.105 (a)). It provides guidance for development of site-specific soil and groundwater remediation objectives.
Safe Drinking Water Act (SDWA)—Maximum Contaminant Levels (MCLs) 40 CFR 141.61 (organic chemicals) 40 CFR 141.62 (inorganic chemicals)	CERCLA 121(d) states that a remedial action will attain a MCL under the SDWA. MCLs are enforceable maximum permissible levels of contaminants in a water supply delivered to any user of a public water system.	ARAR	MCLs are relevant and appropriate for potential drinking water sources per the NCP. Remedies may not have to demonstrate compliance with an ARAR that is technically impracticable.
SDWA—Maximum Contaminant Level Goals (MCLGs) 40 CFR 141.50 (organic chemicals) 40 CFR 141.51 (inorganic chemicals)	CERCLA 121(d)(2)(A) states that a remedial action attain MCLGs where relevant and appropriate. MCLGs are non-enforceable health goals under the SDWA.	ARAR	Non-zero MCLGs may be relevant and appropriate. MCLGs equal to zero are not appropriate for cleanup of groundwater or surface water at CERCLA sites per EPA policy (see NCP).
SDWA—Secondary MCLs (SMCLs) 40 CFR 143	Non-enforceable limits intended as guidelines for use by states in regulating water supplies. Secondary MCLs are related to aesthetic concerns (e.g. taste and odor) and are not health-related.	TBC	SMCLs may be considered if drinking water use of aquifer is considered feasible.
Office of Drinking Water. Drinking water health advisories.	Guidance levels for drinking water issued by Office of Drinking Water	TBC	May be used for chemicals without MCLs if groundwater is to meet drinking water quality.

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Part 620 Illinois Water Quality Standards (IWQS); Part 620.210; 620.410;IWQS Class I: Potable Resource Groundwater	Groundwater must meet the standards appropriate to the groundwater class as specified in Subpart D/Section 620.401-440. Standards apply for potential potable water supply.	ARAR	Applicable to site groundwater. Site groundwater is a class I potable resource groundwater. Not applicable to groundwater 10 feet or less from ground surface or to groundwater from low permeability formations (k < 1 x 10-4 cm/s or <150 gpd from a well screened over 15 foot thickness). Remedies considered for the site may include development of a groundwater management zone (GMZ) that may allow contaminant concentrations higher than designated for Class I groundwater.
IAC Title 35, Part 620.220; 620.420; IWQS Class II: General Resource Groundwater	Applicable to groundwater compatible with agricultural, industrial, recreational, or beneficial uses and not in Classes I, III, or IV.	ARAR for groundwater within 10 feet of ground surface.	Not an ARAR for most of the shallow groundwater because groundwater is Class I. Applicable for groundwater 10 feet or less from ground surface.
IAC Title 35, Part 620.450(a), Alternative Groundwater Quality Standards - Groundwater Quality Restoration Standards	Applies to groundwater within a groundwater management zone. May allow concentrations higher than designated use after remediation.	ARAR	Applicable if a GMZ is used.
Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, OSWER Directive No. 9234.2-25, dated September 1993.	Applies to groundwater at contaminated sites. Establishes criteria for assessing the technical impracticability of groundwater remediation.	TBC	Groundwater in area of DNAPL may make groundwater restoration technically impracticable.
Federal Water Pollution Control Act as amended by the Clean Water Act of 1977, Section 208(b) 40 CFR Part 131–Water Quality Standards	Establishes water quality criteria for specific pollutants for the protection of human health and aquatic life. These federal water quality criteria are non-enforceable guidelines used by the state to set water quality standards for surface water.	TBC	Water quality criteria are TBCs used in setting standards for discharges to surface water from a treatment system.
Pretreatment Standards 40 CFR 403	Pretreatment standards for the control of pollutants discharged to POTWs. The POTW should have either an EPA approved program or a sufficient mechanism to meet the requirements of the national program in accepting CERCLA wastes.	Possible ARAR	ARAR if groundwater is discharged to the Northshore Sanitary District POTW.

Regulation	Requirement	ARAR Status	Analysis
Great Lakes Initiative (GLI), Clean Water Act; 33 U.S.C. §§1251-1387 at 33 U.S.C. §1268, as amended by the Great Lakes Critical Programs Act (Public Law 101-546)	GLI establishes water quality standards, antidegradation policies, and implementation procedures with which state standards must comply for waters in the Great Lakes System.	Possible ARAR	GLI establishes the basis for Illinois State Standards for Lake Michigan water quality.
IAC Title 35, Part 302, Illinois Water Quality Standards General Use - Subpart B, Sections 302.201-212	Section 11 of Environmental Protection Act – Regulations to restore, maintain, and enhance purity of the water of the state. Waters of state for which there is no specific designation • Acute standards apply within mixing zone • Chronic apply after mixing zone	ARAR	Apply to Illinois surface waters that do not have a specific use category.
IAC Title 35, Part 302, Public and Food Processing Water Supply—Subpart C; Sections 302.301-305	Applies to waters of state designated for waters drawn for treatment and distribution as a potable supply or food processing at the point of withdrawal.	Possible ARAR	For Lake Michigan at point of water withdrawal
IAC Title 35, Part 302, Subpart E: Lake Michigan Water Quality Standards. Section 302.501-509.	Applicable to waters of Lake Michigan and the Lake Michigan Basin.	Possible ARAR	Subpart E is for Lake Michigan. Lake Michigan Basin standards are applicable to the harbor and lake water adjacent to the site.
IAC Title 35, Part 303, Subpart C: Specific Use Designations and Site Specific Water Quality Standards, Section 303.443.	Defines standards for "open waters" and "other waters" of the Lake Michigan Basin.	Possible ARAR	Lake Michigan Basin standards are applicable to the harbor and lake water adjacent to the site.
IAC Title 35, Part 304, Effluent Standards	Designates specific effluent limits for discharges to surface water.	Possible ARAR	ARAR if remedial alternative includes discharge to surface water. Substantive requirements must be met for discharges to surface water of treatment system water.

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Part 309, Permits	Designates process used in setting NPDES effluent limits for discharges to surface water.	Possible ARAR	ARAR if remedial alternative includes discharge to surface water. Substantive requirements must be met for discharges of treated water to surface waters.
IAC Title 35, Part 307 Sewer Discharge Criteria, Sections 1101-1103, General and Specific Pretreatment Requirements.	Designates general requirements for discharges to POTWs such as no discharge of pollutants that pass through the POTW or interfere with the operation and performance of the POTW. Also gives specific discharge limits for certain pollutants.	Possible ARAR	ARAR if remedial alternative includes discharge to POTW. Substantive requirements must be met for discharges to Northshore Sanitary District POTW of treatment system water.
IAC Title 35, Part 310 Sections 310.201-202, Pretreatment Programs.	Designates general requirements for discharges to POTWs such as no discharge of pollutants that pass through the POTW or interfere with the operation and performance of the POTW. Also requires POTWs to develop Pretreatment programs.	Possible ARAR	ARAR if remedial alternative includes discharge to POTW. Used by Northshore Sanitary District in setting pretreatment discharge requirements for discharge of treatment system water.
IAC Title 35, Subtitle B: Air Pollution	Regulations contain specific requirements that pertain to allowable emissions of criteria pollutants from a number of air contaminant source categories and processes.	Possible ARAR	ARAR if a remedial alternative results in air emissions. Substantive requirements for air emission control must be met.
IAC Title 35, Part 212, Visible and Particulate Matter Emissions	Regulations contain specific requirements that pertain to allowable emissions of fugitive particulate matter.	ARAR	Dust control must be implemented to control visible particulate emissions during construction activities.
IAC Title 35, Part 245, Odors	Regulations specify how to determine whether a nuisance odor is present.	ARAR	Odor control may be necessary if it is determined that a nuisance odor is present.
Location-Specific ARARs			
Coastal Zone Management Act 16 USC §1451 *et. seq.* 15 CFR Part 930	Federal agencies conducting activities directly affecting the coastal zone are required to conduct those activities in a manner that is consistent, to the maximum extent practicable, with approved State coastal zone management programs.	ARAR	Applicable to construction in the coastal zone.

Regulation	Requirement	ARAR Status	Analysis
Endangered Species Act of 1973 16 U.SC. §1531 *et seq.* 50 CFR Part 200	Federal agencies are required to ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify critical habitat.	ARAR	Not applicable to the DNAPL or groundwater alternatives as all work is to be done on parts of the site where there are no endangered species or habitats.
Protection of Wetlands—Executive Order 11990 50 CFR Part 6, Appendix A	Requires actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. Appendix A requires that no remedial alternatives adversely affect a wetland if another practicable alternative is available. If none is available, effects from implementing the chosen alternative must be mitigated. Public notice and review of activities involving wetlands is required.	ARAR	The ecological risk assessment concluded that wetlands or aquatic habitat are not present onsite. Small wetlands were identified along the north and south ditches between the site and Lake Michigan.
Great Lakes Water Quality Initiative 40 CFR Part 132, Appendix E	Provides guidance to Great Lakes states. States that lowering of water quality standards via wastewater discharge should be minimized.	TBC	Considered as guidance to Great Lakes states in the promulgation of water quality regulations.
Action-Specific ARARs/TBC			
Fish and Wildlife Coordination Act (16 U.S.C. § 661 et seq.)	The Act provides protection and consultation with the U.S. Fish & Wildlife Service and state agencies for actions that may affect streams, wetlands, other water bodies, or protected habitats. Action taken should protect fish or wildlife, and measures should be developed to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	ARAR	The Act is considered an ARAR for construction activities performed during the implementation of remedies that may affect the drainage ditches.
Occupational Safety and Health Act (29 U.S.C. § 61 et seq.)	The Occupational Safety and Health Act was passed in 1970 to ensure worker safety on the job. The U.S. Department of Labor oversees the Act. Worker safety at hazardous waste sites is specifically addressed under 29 CFR §1910.120: Hazardous Waste Operations and Emergency Response; general worker safety is covered elsewhere within the law.	ARAR	The Act is considered an ARAR for construction activities performed during the implementation of remedies.

Regulation	Requirement	ARAR Status	Analysis
Clean Air Act; National Ambient Air Quality Standards (NAAQS) Section 109 40 CFR §§ 50-99	The Clean Air Act is intended to protect the quality of air and promote public health. Title I of the Act directed the USEPA to publish national ambient air quality standards for "criteria pollutants." In addition, USEPA has provided national emission standards for hazardous air pollutants under Title III of the Clean Air Act. Hazardous air pollutants are designated hazardous substances under CERCLA. The Clean Air Act amendments of 1990 greatly expanded the role of National Emission Standards for Hazardous Air Pollutants by designating 179 new hazardous air pollutants and directed USEPA to attain maximum achievable control technology standards for emission sources. Such emission standards are potential ARARs if remedial technologies (e.g. air strippers) produce air emissions of regulated hazardous air pollutants. Specifies requirements for air emissions such as particulates, sulfur dioxide, VOCs, hazardous air pollutants, and asbestos.	ARAR	The Act is considered an ARAR for remedies that involve creation of air emissions, such as excavation activities that might create dust or treatment systems that might emit volatile organic compounds.
IAC Title 35, Environmental Protection, Subtitle B: Air Pollution	This part describes permits and emission standards to protect air quality.	ARAR	Considered an ARAR for remedies that involve creation of air emissions, such as excavation activities that might create dust or treatment systems that might emit volatile organic compounds.
IAC Title 35, Part 212, Subpart K, Fugitive Particulate Matter.	Site construction and processing activities would be subject to Sections 212.304 to .310 and .312 that relate to dust control.	ARAR	Remedial action may generate fugitive dust. Rules require dust control for storage piles, conveyors, on-site traffic, and processing equipment. An operating program (plan) is required and is to be designed for significant reduction of fugitive emissions.

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Subchapter c, Part 722; Standards applicable for generators of hazardous waste.	Establishes regulation of activities of generators of hazardous wastes. Requirements include ID number, record keeping, and use of uniform national manifest.	Possible ARAR	Applicable if wastes are RCRA hazardous and go off-site.
IAC Title 35, Subchapter c, Part 723; Standards applicable for transporters of hazardous waste.	The transport of hazardous waste is subject to requirements including DOT regulations, manifesting, record keeping, and discharge cleanup.	Possible ARAR	Applicable if wastes are RCRA hazardous and go off-site.
IAC Title 35, Subchapter c, Parts 724.650 to 724.655 Subpart S–Special Provisions for Cleanup	Standards applicable for corrective action management units, temporary units and staging piles.	ARAR	Staging piles or temporary units may be needed for soil that may be a characteristic hazardous waste.
IAC Title 35, Environmental Protection, Subtitle G: General Provisions, Chapter I: Pollution Control Board, Subchapter d: Underground Injection Control and Underground Storage Tank Programs; Parts 730 and 738	Underground injection control and underground storage tank programs.	ARAR	These regulations would be an ARAR for remedies involving use of wells for injection of materials to accelerate remediation or reinjection of treated groundwater, remedies that require installation of an underground storage tank or remedies that reinject treated water.
IAC Title 35, Subtitle G: Subchapter f: Part 740, Site Remediation Program	Presents requirements for the site remediation program.	TBC	The Illinois site remediation program requirements under Part 740 are specifically excluded for sites on the NPL (740.105- Applicability).
IAC Title 35, Subtitle G: Subchapter f: Site Remediation Program, Section 740.530, Establishment of Groundwater Management Zones.	Presents requirements for establishment of groundwater management zones (GMZ). GMZs are three-dimensional areas where groundwater exceeds the groundwater standards of 35 IAC Part 620.	TBC	The Illinois site remediation program requirements under Part 740 are specifically excluded for sites on the NPL (740.105- Applicability).

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Subtitle G: Subchapter f: Part 742, Tiered Approach to Remedial Action Objectives.	The purpose of this part is to establish the procedures for investigative and remedial activities at sites where there is a release, threatened release, or suspected release of hazardous substances, pesticides, or petroleum, and for the review of those activities; establish procedures to obtain IEPA review and approval of remediation costs for the environmental remediation tax credit; and establish and administer a program for the payment of remediation costs as a brownfield site. Presents requirements for the tiered approach to corrective action objectives (TACO). Tier 1 remediation objectives are set at 10-6 ELCR and HI =1 values. Section 742.900(d) Tier 3 remediation objectives allow cleanup levels within the ELCR range of 10^{-4} to 10^{-6}.	TBC	TACO is a voluntary program and is not required (Part 742.105(a)). Provides guidance for development of site-specific soil and groundwater remediation objectives. Will be used to establish preliminary remediation goals.
IAC Title 35, Subtitle G: Subchapter f: Tiered Approach to Remedial Action Objectives. Subpart J Institutional Controls, Parts 742.1000 to 742.1020.	Provides requirements for when ICs are needed and presents requirements for implementation of ICs. ICs are needed when land use is assumed to be industrial or commercial, risk exceeds a HI = 1 or ELCR > 1 x 10-6, engineered barriers are used, exposure routes are excluded or when the point of exposure requires control.	TBC	Provides guidance for development of ICs. TACO is a TBC since it is not required.
IAC Title 35, Subtitle G: Subchapter h; Illinois "Superfund" Program. Part 750, Illinois Hazardous Substances Pollution Contingency Plan.	Establishes requirements for investigation and remediation of sites where there has been a release or a substantial threat of a release of a hazardous substance. Parallels U.S. EPA's Superfund program.	TBC	Not an ARAR. The Illinois Hazardous Substances Pollution Contingency Plan is applicable to State response taken at sites that are not the subject of a federal response taken pursuant to CERCLA.

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Parts 807-810, Solid Waste and Special Waste Hauling	This part describes requirements for solid waste and special waste hauling. Special waste must be treated, stored or disposed at a facility permitted to manage special waste. Presents the special waste classes and the method to determine whether the solid waste is a special waste and if so, whether it is Class A (all non-Class B special wastes) or Class B (low or moderate hazard special wastes). RCRA hazardous waste is not included within the special waste classes.	ARAR	ARAR for disposal of solid waste and special waste. Contaminated soil that is not a RCRA hazardous waste would be evaluated to determine whether it is a Class A or B special waste. Offsite disposal of special waste must be at a Solid Waste landfill permitted to receive that special waste class unless IEPA specifically allows otherwise.
IAC Title 35, Subtitle H: Part 900 Noise	Regulations contain specific requirements that pertain to nuisance noise levels.	ARAR	ARAR. Noise levels will need to be controlled if noise reaches nuisance levels.
Lake County Stormwater Management Commission, Watershed Development Ordinance	Regulations specify performance standards for stormwater control.	ARAR	ARAR. Remedial actions need to be evaluated relative to stormwater controls if they disturb more than 5,000 sf of soil. http://www.co.lake.il.us/smc/regulatory/wdo/docs.asp

RESPONSIVENESS SUMMARY

OMC Plant 2 Site
Waukegan, Lake County, Illinois

The U.S. EPA met the public participation requirements of Sections 113(k)(2)(B)(i-v) and 117(b) of CERCLA (42 U.S.C. §§ 9613(k)(2)(B)(i-v) and 9617(b)) during the remedy selection process for the OMC Plant 2 operable unit of the OMC, Inc. site. Sections 113(k)(2)(B)(iv) and 117(b) require U.S. EPA to respond "...to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for a remedial action. This Responsiveness Summary addresses those concerns expressed by the public, potentially responsible parties (PRPs), and governmental bodies in written and oral comments we've received regarding the proposed remedy for the site.

The U.S. EPA has established information repositories for the OMC site at the following locations:

- U.S. EPA - Region 5, Records Center, 77 W. Jackson Blvd., Chicago, IL 60604
- Waukegan Public Library, 128 N. County St., Waukegan, IL 60085

The Administrative Record containing all information we used to select the cleanup remedies for the OMC Plant 2 operable unit is also available to the public at the above locations.

<u>Background</u>

Outboard Marine Corporation declared bankruptcy in December 2000 and filed to legally abandon the OMC Plant 2 property in summer 2002. The U.S. EPA performed several emergency removal actions at the OMC Plant 2 site from 2002-2006 to stabilize the site and to prevent imminent and substantial endangerment to human health and the environment due to contaminants present at the site. The bankruptcy court allowed the OMC bankruptcy trustee to abandon the OMC Plant 2 property in December 2002.

In consultation with Illinois EPA, U.S. EPA began a remedial investigation and feasibility study at the OMC Plant 2 site in fall 2004. We sampled the soil, sediment, interior building surfaces, and groundwater at the site for contaminants. We performed a human health and an ecological risk assessment using our sampling data to determine actual or potential risks to human health and the environment posed by site contaminants. We completed the remedial investigation in April 2006 and we released a feasibility study (FS) report in summer 2006 that evaluated methods to clean up the contaminated media at the site. We issued a proposed cleanup plan for the building and soil and sediment media in January 2007 and selected cleanup remedies for these media in a September 2007 Record of Decision.

The U.S. EPA also completed a pilot study at the site for innovative groundwater cleanup methods in March 2008. We issued a supplemental feasibility study for cleanup of the groundwater and TCE DNAPL media at the site in July 2008.

On about August 2, 2008, U.S. EPA issued a proposed plan fact sheet to the public to summarize the results of the remedial investigation for the OMC Plant 2 operable unit and to present our recommended cleanup remedies for the contaminated groundwater and TCE DNAPL portions of the site. The proposed plan was available for public comment from August 2 through October 2, 2008. We placed an advertisement announcing the availability of the proposed plan and the start of the comment period in the *News-Sun,* a local newspaper of wide circulation in the Waukegan area. Staff also hand-delivered fact sheets translated into Spanish to area churches for distribution. Each fact sheet contained an EPA-addressed comment page to facilitate receipt of mailed comments. We accepted written, e-mailed, or faxed comments during the comment period.

The U.S. EPA held a public meeting and public hearing at Waukegan City Hall on August 14, 2008, to discuss the results of the remedial investigation, to answer any questions regarding the proposed cleanup actions, and to take oral comments regarding the proposed cleanup actions. More than 40 persons, including local residents, attended the public meeting. A court reporter documented formal oral comments on the proposed plan during the public meeting, and we placed a verbatim transcript of the public comments into the information repositories and the Administrative Record. We received 6 oral comments concerning the proposed plan at the public meeting.

The U.S. EPA also received 7 written (by letter, e-mail, or fax) comments concerning the proposed plan during the comment period. The comments received during the public comment period and our responses to these comments are included in this Responsiveness Summary, which is a part of the Record of Decision for the OMC Plant 2 site.

<u>Summary of Significant Comments</u>

A. **Written Comments**

1. **U.S. Representative Mark Kirk**, 10th District, IL; via letter (excerpted here; complete letter is in the administrative record):

Rep. Kirk stated in his comment letter that the "harmful contaminants that saturate the [OMC site] area are a hazard to human health, the ecosystem and the economy." He briefly discussed the OMC Plant 2 site conditions and commented that:

> "I lend my full support to the proposed cleanup plan and urge swift action in order to begin this process as soon as possible. Cleanup of this area will ensure the future health of our children and sustainability of the ecosystem. Full remediation also promises increased property taxes and thus education funding, recreation and commercial investment and tourism revenues. In sum, the plant's cleanup will improve the overall quality of life for all residents in northeastern Illinois."

Response:

The U.S. EPA acknowledges Rep. Kirk's support for the proposed groundwater and DNAPL media cleanup plan and we agree that the OMC Plant 2 site cleanup will help improve the overall quality of life for residents of northeastern Illinois.

2. **Sara Griffin**, Waukegan, IL; via letter written on the comment sheet insert in the proposed plan fact sheet:

> "As a member of the Waukegan Renaissance Commission I ask that the EPA co-operate with the City of Waukegan and the City's Master Plan. The City is working to develop and clean up not only the lakefront sites but the Waukegan Harbor. A plan is in place to do so. I might add that the work is underway and progress is evident."

Response:

The U.S. EPA notes that it has been cooperating to the extent practicable with Waukegan concerning the cleanup actions slated for the OMC site, especially with regard to the City's master plan. We have briefed City officials from time to time concerning the results of our studies and we've met with them at their request to discuss redevelopment potential of the OMC properties with regards to environmental contaminants. As a result, this cleanup plan makes residential development possible and it is entirely consistent with the master plan.

For more specific responses to the City's concerns, please see the City's written comments (#6) below.

3. **Bill Muno**, Evanston, IL; via e-mail:

Mr. Muno stated that he reviewed the OMC Plant 2 proposed plan on behalf of the Alliance for the Great Lakes (AGL) and commented that:

> "I support the preferred alternatives for both TCE source control and groundwater cleanup. ...timely clean-up of the contamination at Plant 2 will be a positive step to encourage the larger Harbor redevelopment project. Thus, the AGL strongly supports expeditious funding of RD/RA [remedial design/remedial action] for the Plant 2 clean-up as soon as the ROD is signed."

Response:

The U.S. EPA acknowledges Mr. Muno's support for the proposed OMC Plant 2 groundwater and DNAPL media cleanup plan.

4. **Keith Gray**, Integrated Lakes Management, Inc., Waukegan, IL; via letter written on the comment sheet insert in the proposed plan fact sheet:

Mr. Gray stated that he has been involved with environmental clean-ups and monitoring throughout his adult life as an owner of a laboratory and as a manager of an aquatic management firm. He commented that:

> "...I understand the challenges and complexities of these types of projects and applaud the EPA's pro-active pilot testing of in situ processes that has saved money and time.
>
> "There is significant pressure being exerted by local groups who clearly lack the fundamental knowledge needed to be able to evaluate the various options objectively.
>
> "I encourage the Agency to continue to do what is right in order to decontaminate our environment and to protect the health of future occupants of the site in the fastest, most cost-effective manner."

Response:

The U.S. EPA acknowledges Mr. Gray's support for the proposed OMC Plant 2 groundwater and DNAPL media cleanup plan.

5. **Chris Tanner, P.E.**, Libertyville, IL; via letter written on the comment sheet insert in the proposed plan fact sheet:

Mr. Tanner stated that he is a consulting environmental engineer and that he has been involved with soil and groundwater cleanups for over 20 years, an active member of the Waukegan Community Advisory Group for over 10 years, and a Lake County, IL resident for 18 years. His environmental experience includes working on Superfund remedial investigations and feasibility studies involving TCE [trichloroethylene] contamination and he stated that he is familiar with the geology and hydrogeology of Waukegan Harbor. He commented that:

> "I am very much concerned that the OMC remediation be done as completely as possible within the practical limits of technical and financial resources.
>
> "It is my professional opinion that contaminant release mechanisms, migration pathways and potential receptors have been well characterized, and that an appropriate range of remedial options has been considered. Chlorinated solvents like TCE are notoriously difficult to remove in the presence of DNAPL, but a balanced array of proven methodologies has been thoughtfully assembled.
>
> "It is my professional opinion that the USEPA has made a selection based on a transparent and objective review of each [cleanup] option…The agency has combined alternatives and balanced tradeoffs to yield a sound strategy for remediation.
>
> "I wholly support…institutional controls and monitoring, while at the same time attacking DNAPL with in situ chemical treatment. It is critical that the DNAPL be destroyed.
>
> "Finally, I respect USEPA's commitment to 5-year reviews after remediation has been completed to make sure that remediation has been effective, and also to remain open to any new understandings of human and environmental toxicity, treatment technologies, and public perception."

<u>Response</u>:

The U.S. EPA agrees that the DNAPL must be addressed so that the groundwater cleanup can be successful. We acknowledge Mr. Tanner's support for the proposed OMC Plant 2 groundwater and DNAPL media cleanup plan.

6. **Timothy Harrington, P.E.**, Hard Hat Services LLC, Chesterton, IN; via letter (excerpted here; complete letter is in the administrative record):

Mr. Harrington provided written comments on the proposed plan on behalf of the City of Waukegan and stated that

> "Our first impression is that certain activities could interfere with the City's ability to develop the [OMC Plant 2] property in accordance with its Master Plan…"

He provided a recommended alternate remedy and stated that they "may allow for a more rapid completion of the remedy at the same degree of environmental protectiveness and therefore allow for development of the property in a more expeditious manner." The City's recommended cleanup alternatives include:

> "Removal [excavation] of DNAPL soil with [thermal] treatment and placement on site in the eco-park area – [estimated cost] $2,600,000,
>
> "Monitored Natural Attenuation [MNA] with engineered barriers and surface soil treatment – [estimated cost] $1,975,000, and
>
> "No further action for off-site groundwater – [estimated cost] $0"

Response:

The U.S. EPA notes that the City very recently completed the demolition of the "clean" portion of the abandoned OMC Plant 2 facility (the "New Die Cast" area) and removed all debris from the site. We understand that the City may be anxious to open this small area of the property up for redevelopment as soon as possible. We believe that it is more realistic, however, to assume that this part of the property would only be available for a successful redevelopment when the rest of the OMC Plant 2 property has been cleaned up. So far, U.S. EPA has not received funding to begin the previously-selected building demolition or the soil cleanup actions. Thus, until the (unsightly) OMC Plant 2 building is removed, it may be premature to think that development can immediately and successfully begin on the New Die Cast area piece of the property.

DNAPL Alternative

There are several reasons why we disagree with implementing the recommended DNAPL cleanup method offered by the City. First, we believe that an *in situ* cleanup method would be far safer to implement than the suggested excavation and thermal treatment alternative. There would be a much greater chance of cleanup workers being exposed to harmful levels of VOCs if the excavation work is conducted because digging up the contaminated soil would cause the TCE to be volatilized to the atmosphere around the excavation. Second, the cost estimate provided by the City for the excavation and treatment alternative, already at a cost higher than our proposed alternative ($2.6 million vs. $2.0 million), is much too low. There is no provision to treat off-gas from treated groundwater pumped from the excavation – this water will have very high levels of VOCs dissolved in it that the City proposes to treat using an air stripper. It would be unsafe and unlawful to vent the high levels of VOCs to the atmosphere from the air stripper without treatment. Third, materials handling costs are not estimated – these are presumed by U.S. EPA to be very high due to the presence of free product (TCE) in the sand. Lastly, U.S. EPA evaluated an *in situ* thermal treatment approach in the feasibility study for the TCE DNAPL beneath the site and this cost was estimated at $9.8 million. The cost of the City's proposed *ex situ* thermal treatment remedy is more likely to be in the range of the *in situ* thermal treatment cost estimate than the its $2.6 million estimate.

Groundwater Alternative

The U.S. EPA also disagrees with the City's suggested use of MNA and institutional controls (ICs) alone to address contaminated groundwater. The City provided an interpretation of U.S. EPA's pilot study results for enhanced *in situ* bioremediation (as not being effective) as a basis for its suggested use of MNA and ICs alone. Also, the City suggested that the proposed groundwater remedy would interfere with rapid redevelopment of the site in that the injection wells for the bioremediation approach would need to stay in the ground for up to ten years while U.S. EPA conducted the cleanup.

Unfortunately, the City's interpretation is incorrect that the bioremediation pilot study results showed that this approach is ineffective. The City assumed that dilution (due to injection of substrate mixtures) alone reduced TCE concentrations in groundwater samples taken from the injection wells. However, the City failed to account for the increased levels of TCE breakdown products seen in water samples taken after the injections occurred. Much higher levels of vinyl chloride and *cis*-1,2-DCE were seen in the test wells, which shows that TCE was being broken down at meaningful rates.

The City's objection to the length of time that injection wells would be maintained because they would interfere with redevelopment is misplaced. The estimated ten-year time frame is somewhat comparable to the estimated operating time frame for the Waukegan Coke Plant (WCP) site groundwater treatment plant constructed inside the "Triax" building on the OMC Plant 2 property. The treatment plant just began to start processing contaminated water from the WCP site in Fall 2008 and is projected to operate for a 3-8 year time period. Thus, the Triax building will not be demolished for at least 3-8 years, if not longer, so no development is going to occur in that area in the near term.

Additionally, while we agree that ICs can provide a measure of short-term protectiveness, we note that it would take as much as ten decades to achieve cleanup levels in the aquifer using this approach. Groundwater cleanup policy suggests that it is preferable to restore an aquifer to its beneficial uses as soon as practicable. U.S. EPA believes that our proposed bioremediation approach would reduce the time frame for aquifer restoration to as little as three decades, which is in keeping with this cleanup policy.

Air Sparge Curtain

The City suggested that no further action be done to stop the off-site migration of VOCs towards the harbor (beneath Larsen Marine Service property) because the groundwater well at the end of the north harbor is not impacted nor will the groundwater be a risk to harbor water quality. The U.S. EPA disagrees that the plume is not impacting off-site resources (see Figure 5). We believe that the air sparge curtain remedy is needed to reduce off-site migration of VOCs because more rapid movement of the plume offsite is forecast when the OMC Plant 2 building and concrete slab are eventually removed. The air sparge curtain will help prevent potential indoor air intrusion issues at Larsen Marine Service while the groundwater source areas and plume are being addressed on site.

7. **Jean "Susie" Schreiber**, Chair, Waukegan Harbor Citizens Advisory Group; via letter:

> "The majority of the Waukegan Harbor Citizens Advisory Group [Waukegan CAG] concurs with the remediation selections chosen by the USEPA Region V Superfund Project Team for the cleanup of the ground water and DNAPL contamination residing on the OMC Plant 2 Operable Unit of the OMC Superfund Site in the Waukegan Harbor Area of Concern.
>
> "We are appreciative of the thorough and detailed analysis work that went into the USEPA cleanup option selection process. We applaud the open meeting presentations of the site issues, and the supportive printed materials utilized, to keep the Waukegan CAG and the public informed of the site problems and remediation tools available to remove the contaminants. The list of thoughtfully recommended choices from which the final clean up can be effected considered the criteria of long term protection of human health and the environment, the standards which must be met for both soil and groundwater cleanup, short term and long term costs, effectiveness of the selected processes, and of course implementability.
>
> "The USEPA should continue to closely follow the Superfund site remediation process in order to return the Waukegan lakefront to the general public in an effective, long term, environmentally safe status."

Response:

The U.S. EPA acknowledges the Waukegan CAG's support for the proposed OMC Plant 2 groundwater and DNAPL media cleanup plan. We shall continue to apply the Superfund cleanup process at the OMC site and conduct required remedial actions so that long term protectiveness may be achieved as soon as practicable.

B. **Oral Comments (per transcript from the August 14, 2008 public hearing)**

1. **Jeff Jeep**, Jeep and Blazer, LLC, special environmental counsel for the City of Waukegan:

Mr. Jeep gave a very lengthy statement on behalf of the City of Waukegan. He opened by thanking U.S. EPA for all the work accomplished to date and acknowledged that the Agency has been cooperative with respect to working with the City's master plan when addressing cleanup of the OMC site. However, he indicated that he had "some concerns" and that the City would follow up in writing (see written comments #6, above), about the proposed groundwater cleanup remedies:

> "My comments are aimed at ensuring that the plan for the groundwater does not delay the redevelopment of the land in compliance with our Master Plan."

Mr. Jeep's comments can be summarized as:

a. Bioremediation has a spotty history (and may not be right for this site);
b. Bioremediation may take too long and delay redevelopment;
c. Why not just dig up the source areas, heat the sand, and put it back into the ground? and
d. Why not allow for a developer to be able to choose to perform the (c, above) cleanup option?

<u>Response</u>:

The U.S. EPA acknowledges the City's concerns over timely redevelopment of the OMC Plant 2 site. However, we believe that enhanced bioremediation is a good choice for this site. We conducted a pilot test out at the OMC Plant 2 site using potential cleanup reagents on the actual groundwater contaminant source zones that are targeted for cleanup. The testing results showed that the approach works well at the OMC site. Moreover, a four-year period of injections is not onerous, especially when the majority of the targeted areas are outside the areas targeted for condominiums. The injection wells will for the most part be away from areas for buildings so they will not get in the way of development.

With regard to the question of whether to dig up the source areas and heat the soil to remove the VOCs, as discussed in the written comment section this would be an overly costly approach. It is also likely an approach that is less safe than an *in situ* treatment remedy because workers could be exposed to VOCs as contaminated material is dug from the ground. The U.S. EPA would not preclude a developer from pursuing the dig and heat remedy, though. We would require that the work be safely conducted under our oversight authority.

2. **Carol Dore**, Waukegan, IL:

> "...I think if the City is concerned about the EPA's plan and the delay of building condos on former OMC property that is a concern to me as a citizen. If the City thinks you should dig down two feet and dig up the dirty stuff, then I think

perhaps that's what should be done. As a citizen, I am opposed to any plan that will delay the implementation of the City's Master Plan and I think it's a great plan and I don't want to see it put on the back burner for any reason."

Response:

The U.S. EPA notes the City's master plan for the area called for the building of condominiums and shops in the site area after a 15-20 year time frame during which environmental matters would be taken care of. Thus, conduct of the groundwater cleanup work at the site over the next ten years would not constitute a delay. Moreover, the plan did not address who would be conducting or paying for the cleanup actions at the site.

Although digging up the top two feet of soil in the source areas to remove the VOC contamination from the ground is not what the City is suggesting (excavations could exceed thirty feet in depth), as discussed above, U.S. EPA believes that such a cleanup would not be as safe and would be more costly to conduct than our proposed remedies for the site.

3. **Bill Anderson**, Waukegan, IL:

Mr. Anderson gave a lengthy statement and his comments can be summarized as:

a. Bioremediation has a spotty history (and may not be right for this site);
b. 'Dredging or siphoning out' the hot spots could be doable;
c. He would like to see the area return for development as soon as possible and is unsure whether the proposed plans fully account for that; and
d. He believes that protection similar to the air sparge curtain should be afforded to the lakefront side of the site as well to the south

Response:

The U.S. EPA acknowledges the City's concerns over timely redevelopment of the OMC Plant 2 site. However, we believe that enhanced bioremediation is a good choice for this site. We conducted a pilot test out at the OMC Plant 2 site using potential cleanup reagents on the actual groundwater contaminant source zones that are targeted for cleanup. The testing results showed that the approach works well at the OMC site. Also, U.S. EPA believes that digging up the contamination and heating it ("dredging and siphoning") would not be as safe and would be more costly to conduct than our proposed remedies for the site.

We targeted the air sparge curtain for the southern site boundary to cut off the flow of VOCs in groundwater beneath the Larsen Marine Service property due to potential indoor air intrusion issues. Otherwise we see no risks in the discharge of impacted groundwater to the harbor or the lake because VOC levels are quite low. Thus, we did not see the need to install a similar unit along the eastern boundary of the site to protect lake water quality.

4. **Jeffery Rothbart**, Waukegan, IL:

Mr. Rothbart gave a statement and his comments can be summarized as:

a. Waukegan will be the center of new development (between Milwaukee and Chicago);
b. EPA should either clean up the site right away or "get out of the way" and let developers clean it up; and
c. Let Waukegan take the lead in cleaning up the land

Response:

The U.S. EPA acknowledges the potential for Waukegan redevelopment opportunities and we would have no objection to considering plans by a developer to conduct the OMC Plant 2 cleanup actions as long as we are satisfied that it will be done safely, under our oversight, and in accordance with all laws and regulations governing site cleanups.

5. **Susan Link**, Chair, Waukegan Business Association (WBA), Waukegan, IL:

Ms. Link read a prepared statement from the WBA that can be summarized as:

a. We have confidence in the City's staff and consultants and support their decisions with respect to lakefront redevelopment;
b. We are anxious to see redevelopment of the lakefront begin as quickly as possible as it will be a boost to City businesses; and
c. We urge EPA to expedite the process

Response:

The U.S. EPA acknowledges the WBA concerns and assures it that we are working with the City and its consultants to clean up the OMC sites as soon as practicable.

6. **Roy Czajkowski**, Waukegan, IL

Mr. Czajkowski gave a long statement and his comments can be summarized as:

a. I am encouraged that bioremediation was tested on site and that it worked;
b. I think it is a good alternative to digging up the waste;
c. I like the concept of the barrier which stops the flow of chemicals into the lake;

d. "And it appears that this has been a very well thought out plan, the one that I think the City and also all the environmental people should support because it's a good solution."

Response:

The U.S. EPA acknowledges the support for the proposed groundwater and DNAPL cleanup remedies.